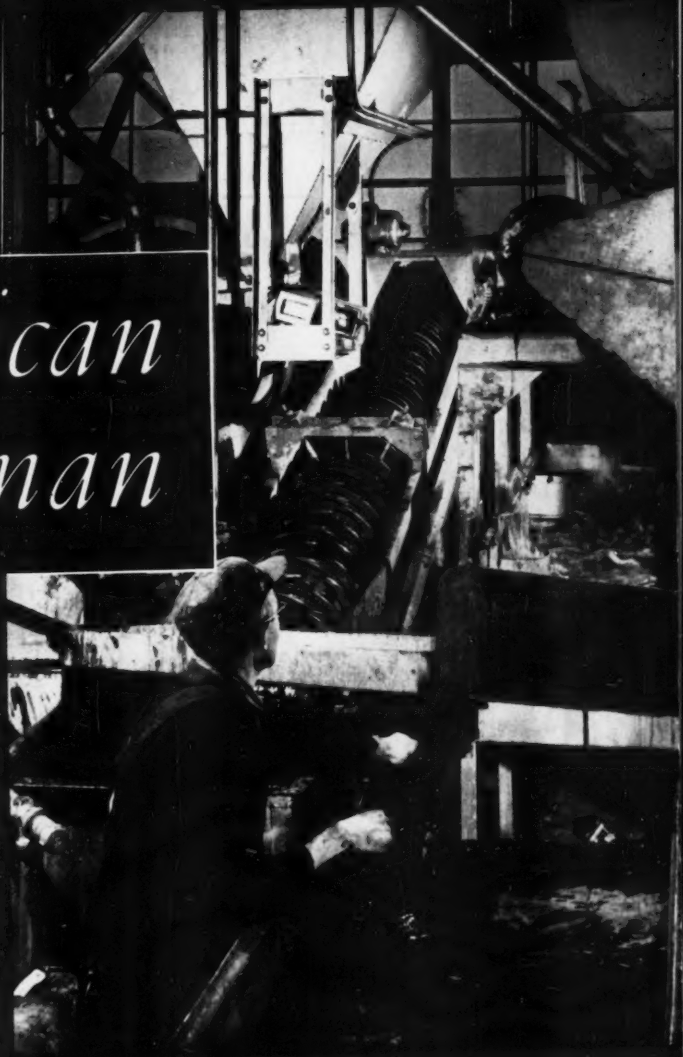
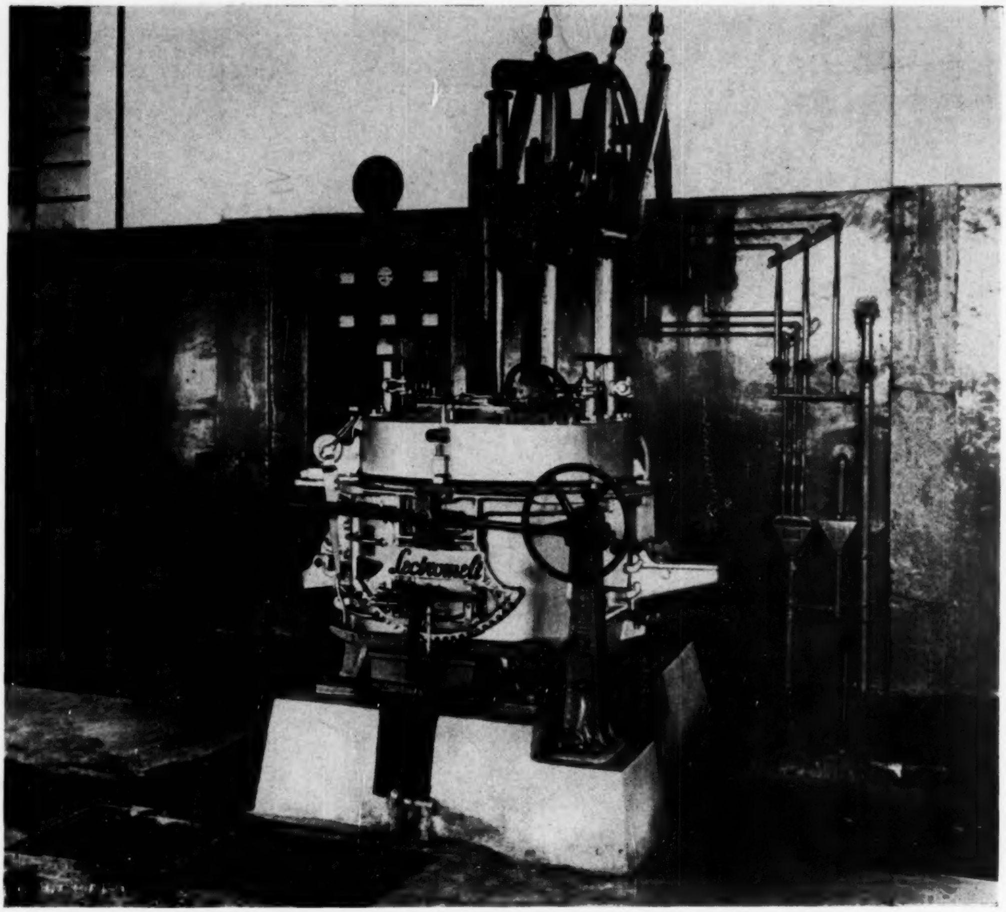
AUGUST • 1949

American Foundryman



THE FOUNDRYMEN'S *Own* MAGAZINE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American Foundryman

August, 1949

Official publication of American Foundrymen's Society

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This Month's Cover

Recovering metal from slag at the new nonferrous foundry of the National Bearing Division, American Brake Shoe Company at Meadville, Pa. The entire reclamation system which is a water flotation process is designed to handle 20,000 pounds in an eight hour day. Metal recoveries run approximately 65 per cent by weight.

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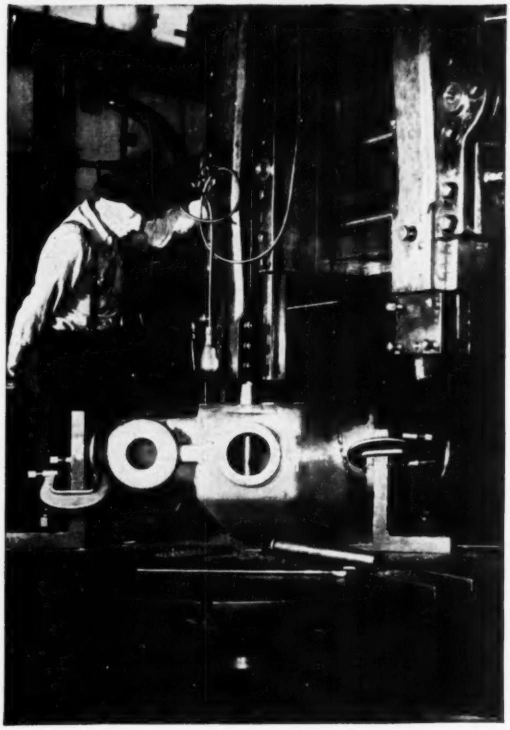
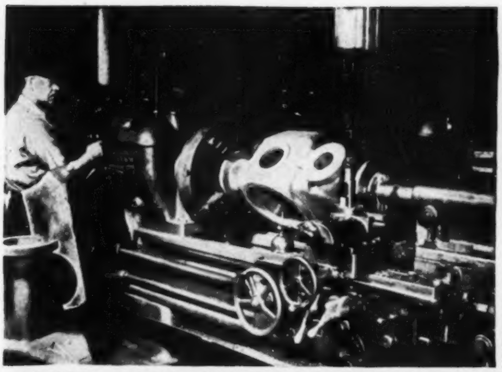
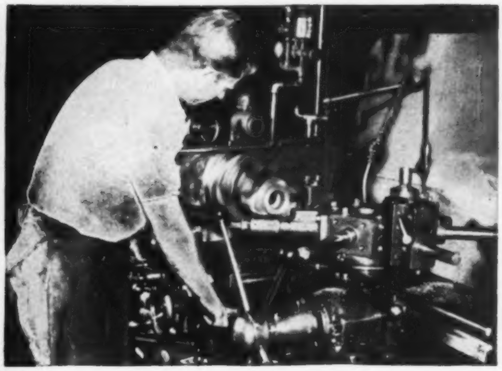


Photo Credit: Photos showing machining of castings, which have been treated with FERROCARBO Briquettes, are by the courtesy of the Rockwell Manufacturing Company, Pittsburgh, Pa. Castings were produced at Monnessen Foundry, a division of Rockwell.



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Education For Castings Users And Producers

ADEQUATE FOUNDRY education and training for those who will buy, specify, or design castings has long been a goal of the college committees of the A.F.S. Educational Division. Increasingly, the designer and/or specification writer is a graduate of an engineering college.

Foundrymen and forward-looking foundry educators have continually stressed the importance of giving engineering students a real appreciation of the potentialities and limitations of foundry processes and products along with the best possible design information. In this connection papers have been presented before the American Society for Engineering Education, before A.F.S. chapters and at Annual Meetings, and before other gatherings. Articles have appeared in Society literature and elsewhere pointing out that an up-to-date college course in foundry instruction is essential to well-rounded engineering education.

Repeatedly the point has been made that all engineers should receive foundry instruction. Nevertheless, the educational trend for some years has been away from this basic point. Administrators in the educational field too often think of foundry operations as they were several decades ago (when current department heads and deans were students or embryo engineers), not as they are now. Some still actually believe the casting process is outmoded . . . a relic of the past . . . something quaint . . . and that it will eventually be replaced by other methods of fabrication.

The history of the castings industry has always been one of progress. Because of the basic nature of foundry products, foundries have been essential to the development of civilization since prehistoric times.

Foundry processes and operations are constantly changing. Mechanization and modernization continue. Metallurgical advances—nodular graphite cast iron, for instance—continue to be made. In the personnel field the most notable gain has been the interest stimulated in foundry education in the colleges and universities by the Foundry Educational Foundation, now two years old, by the A.F.S. Educational Division, and by the regular and Student Chapters of the Society.

The case for proper foundry education for all engineers has been well presented but not as vigorously prosecuted as the case for well-trained college graduates expected to enter the industry to *produce* castings. FEF activities in the latter field have been particularly notable.

In this issue of AMERICAN FOUNDRYMAN, on page 33, the role of the foundry engineer is well portrayed. Need for wide dissemination of modern usable casting design information is emphasized.

Foundrymen who agree there is need for more and better foundry engineers and who recognize the shortcomings in current design information as presented in most colleges today can learn how to correct the condition by reading *"How Foundrymen Can Activate College Foundry Courses,"* page 60, this issue. The authoritative views of an educator, the article tells how schools shape their curricula to conform with the pressures and meet the needs of an industry *if the industry will only present its point of view!*

The foundry industry must make sure that castings are specified and purchased whenever possible. And the industry must be ready to provide well-engineered castings for applications not normally in its field as a result of increased awareness of the usefulness of castings and in the event that other metal products cannot be produced because of lack of raw materials.

Foundrymen are remiss in their duty to themselves and to their industry if they do not take every opportunity to promote adequate foundry education and training for all who are to buy, specify, design, or purchase metal castings. —*Editor.*

(1)

(2)

A REVIEW OF ENTRIES IN THE 26TH A.F.S. APPRENTICE CONTEST

This review of entries in the 1949 Annual A.F.S. Apprentice Contest illustrates the ingenuity of today's foundry and patternmaking apprentices, and points out desirable and undesirable practices to this year's contestants and to those who will compete in the 1950 Contest, opening September 15, 1949.

By Roy W. Schroeder
Chairman
A.F.S. Apprentice Contest Committee

Largest in A.F.S. history, the 1949 Apprentice Contest drew approximately 300 gray iron, steel and non-ferrous molding and patternmaking entries from the United States and Canada. In preparation for the National Contest, which was judged April 2 in St. Louis, seven A.F.S. Chapters held local Apprentice Contests—Northern California, St. Louis District, Washington, Wisconsin, Detroit, Northeastern Ohio and Eastern Canada—in many instances offering prizes to the winning apprentices.

Castings and patterns entered in the National Contest—71 of them, representing the best selected from Chapter and plant contests held throughout the United States and Canada—were exhibited at the Hotel Jefferson during the 53rd A.F.S. Convention in St. Louis, May 2-5. The four top divisional contest winners were guests of the Society at the Convention, where they were awarded $100 prizes and certificates by A.F.S. President Wallis.

This year, for the first time, one pattern design and size was used for all three molding divisions—an innovation which permits interesting comparisons between gating and risering practices for the various types of alloys. All castings in the National judging were radiographed by American Steel Foundries, Granite City, Ill., and the Scullin Steel Co., St. Louis.

As shown in the accompanying illustrations, there was a wide variety of gating and risering. It is of interest to compare the castings shown in Figures

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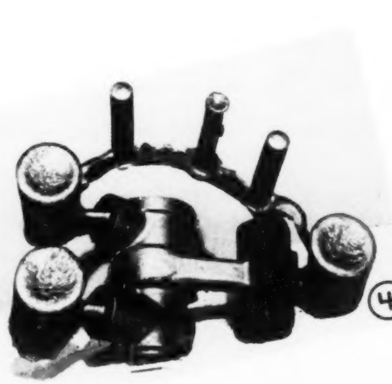

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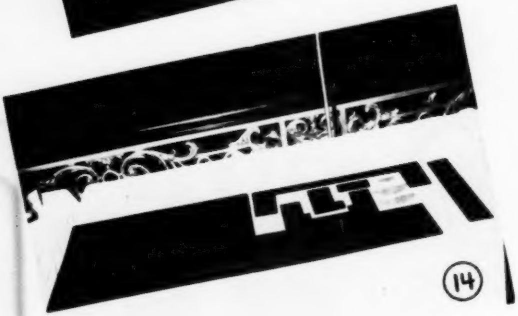


1 and 2. Figure 1 is the first prize winner in the Gray Iron Molding Division and shows the best metal yield of all entries. The manganese bronze casting shown in Figure 2 was awarded third prize in the Non-Ferrous Molding Division. As illustrated by the casting in Figure 1, proper cutting of the channel connecting the riser with the casting permits the riser to be broken off and the casting finished at a low grinding cost. The casting shown in Figure 2 has larger areas of tougher material to grind, increasing the cleaning cost, and will require the use of a cut-off wheel.

Gate Through Riser

All three castings made use of the practice of gating through the riser, with good results, as proved by radiographic examination. The second place winner in the Non-Ferrous Division, an aluminum casting (Fig. 4), made use of the blind riser, thus cutting down on the amount of metal required to pour the job. Figure 5 shows the first prize winner in the Steel Molding Division. This apprentice used the blind riser and the Williams core to give increased yield. There is also a definite point of cut-off risers.

In the casting shown in Figure 6, it is difficult to determine just where the casting ends and the riser begins. In the cutting of risers on all jobs it should be kept in mind that the outline of the casting must be maintained in order to keep down cleaning cost and to avoid the possibility of making scrap castings in the cleaning room. Excessive metal used in gates and risers serves no useful purpose and adds to the cost of handling. This added cost, if not corrected, can lead to red ink in the ledger.

The aluminum casting shown in Figure 7 shows a small connecting link which will freeze before the casting or risers, thus adding to the shrinkage problem. The yield from this casting would be less than from that shown in Figure 3.

Figures 8 and 9, showing the second and third place winners in Gray Iron Molding, respectively, make use of strainer cores to insure clean metal, and of a good-sized feeder block to insure casting soundness. It is possible that a Washburne core used here would give satisfactory results and would lower chipping and grinding costs.

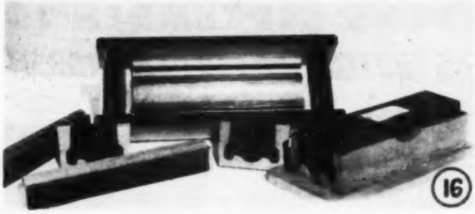
Excessive Gating Cuts Yield

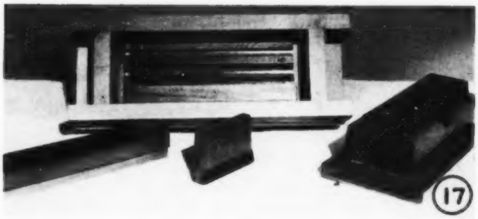
Figure 4 shows a clean-surfaced bronze casting with a rather complicated gating procedure. That it was effective in trapping slag is apparent, but here the connecting channel between the riser and casting is so small that the soundness of the casting might be in question. The casting illustrated in Figure 11 shows proper cutting of the riser channel. The question here is whether the cut portion of the riser will stay fluid long enough to feed the casting. The extensive gating used in the casting in Figure 12 reduces the yield, and as all of the gate surfaces cut offer areas more easily cut and washed by molten metal, it would be to the advantage of the apprentice to reduce the length of the runners and gates. Less than one-half of the runner in the cope, with one channel cut to the riser would be sufficient. The connecting channel between the riser and the casting is too small and too long to do a good job of feeding the heavy sections.

Figure 11 shows the first place winner in the Non-Ferrous Molding Division. This contestant kept the pattern lines well defined and made use of the cope runner to obtain clean metal in the casting. Gating into the risers insures hot metal at this point and guarantees against shrinkage.

Figure 10 shows a casting with a very low metal yield and some dirt inclusions, and would require

Roy W. Schroeder, (left), Apprentice Contest Committee Chairman and F. W. Burgdorfer, Missouri Pattern Works, St. Louis, a member of the Committee, look over the first-prize winning pattern entry.





expensive cleaning operations—if the casting could be saved. There is no mark for the cut-off man to follow in removing the riser from the rear boss.

Figure 13 shows the display put on by GI students of the David Ranken, Jr., Trade School for a contest arranged by the A.F.S. St. Louis District Chapter. This contest created considerable interest among the students. All who participated received invitations to a dinner and prizes were awarded the first, second and third place winners.

Gating and risering practices vary with different sections of the country. Practices in patternmaking show the same regional divergence of thought and, of course, construction of patterns from the same drawing will vary according to the shops and localities in which they are made.

F. W. Burgdorfer, president, Missouri Pattern Works, St. Louis, and a member of the A.F.S. Apprentice Contest Committee made a complete layout and cut templates to aid judges in selecting winners in the Patternmaking Division. Figure 14 shows the layout and templates, which proved helpful in speeding the preliminary judging.

Prize Winning Patterns Similar

After all patterns had been graded, the top seven were placed on a table and the judges were instructed to pick out the first, second and third place winners. After more than two hours of checking and rechecking, the judges decided upon the patterns shown in Figures 15, 16, and 17 as first, second, and third place winners, respectively.

Figure 15 shows the author and F. W. Burgdorfer examining the first-prize winning pattern. The only real difference in the construction of these three boxes was in the location of the end loose pieces. The slots in the bottoms of the patterns shown in Figures 16 and 17 would make the boxes harder to keep clean and would permit sand grains to lodge between the slots and loose pieces—making it possible for a loose piece to stick and cause the core to tear. All three patterns were well constructed and would easily produce the required 25 castings.

Figure 18 shows patterns using three methods where undoubtedly the thoughts in mind were the saving of core costs. The construction of the patterns at left and right in the photograph would allow for fairly heavy ramming without too much care being taken on the part of the molder, but the thin wall section on the pattern in the center would undoubtedly spring in or out, depending upon where the ramming was the hardest, and cause difficulty in drawing the pattern from the mold. This type of construction calls for tie bars or stop-off strips to support the side wall of the pattern—otherwise a great deal of judgment would have to be exercised in making molds.

Contest pattern construction time varied from 15 to 84 hours. Figure 19 shows the complete display of patterns and castings.

St. Louis Foundrymen Judge Contest

The Apprentice Contest had 50 companies and seven A.F.S. Chapters represented in the National Judging, which was done by six St. Louis area foundrymen—C. B. Shanley, Semi-Steel Casting Co.; T. E. Padkins, Scullin Steel Co.; and Steve Ban, National Bearing Division, American Brake Shoe Co. for the molding divisions; and Fred W. Wack, Central Pattern Co.; Roy A. Jacobsen, Carondelet Foundry Co.; and Harry Fraser, Scullin Steel Co., for the Patternmaking Division of the Contest. National judging of castings entries took place at the Scullin Steel Co., St. Louis, and patternmaking judging at the David Ranken, Jr., Trade School, St. Louis, April 2.

APPRENTICE CONTEST OPENS SEPTEMBER 15

ADD METAL PATTERNMAKING AS 5TH CONTEST DIVISION

In recognition of current trends in the foundry industry toward use of high-production, repetitive patterns, a fifth division has been added to the 1950 A.F.S. Apprentice Contest—Metal Patternmaking. The 27th Contest has been tentatively scheduled to get under way September 15 and will close March 1, 1950. The National Judging will take place in Cleveland April 8, 1950, according to Roy W. Schroeder, A.F.S. Apprentice Contest Committee chairman.

Competition is open in Gray Iron, Steel and Non-Ferrous Molding, Wood Patternmaking and Metal Patternmaking. Prizes of $100, $50 and $25 will be awarded the three top winners in each Division. All winners receive a certificate of recognition, and the five first prize winners will receive round trip rail and Pullman fare to the 1950 A.F.S. Foundry Congress & Exhibit, Cleveland, May 8-12.

The Contest is open to any apprentice taking a training course of not less than three years' duration, and who is not over 24 years of age on the day he competes in the Contest. Veterans of World War II are eligible to compete in the Contest if their age less their term of service is not over 24.

Several A.F.S. Chapters, as in past years, will this year conduct local contests to select castings and patterns to be sent to Cleveland for the National Judging. Sponsors and entrants are urged to consult officials of the nearest A.F.S. Chapter to see whether a local contest will be held, before entering directly into the National Contest. Plants in areas where Chapter contests will not be held may conduct a plant contest to select entrants for the National Contest.

Regulations governing the Contest, molding contest patterns, drawings for the wood patternmaking contest, and drawings and rough castings for the newly-created Metal Patternmaking Division will be furnished by A.F.S. Headquarters, Chicago.

Entrants are requested to apply through their sponsors to Jos. E. Foster, Technical Assistant, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill., for entry blanks and further information on the 1950 A.F.S. Apprentice Contest.

A.F.S. National President W. B. Wallis (left), congratulates the top divisional winners in the 1949 Apprentice Contest during the 53rd A.F.S. Convention in St. Louis. Left to right: Elmer J. Turk, Wellman Bronze & Aluminum Foundry, Cleveland; John W. Burkholder, Jr., Central Pattern Co., St. Louis; Raymond S. Lipowski, Bucyrus-Erie Co., Milwaukee; and William C. Oliver, Jr., Caterpillar Tractor Co., Peoria, Ill. Following presentation of $100 prizes and certificates, President Wallis said: "Many men who started as apprentices in the foundry are today known throughout the country and even the world for what they have accomplished by seizing opportunities the Society has presented to them . . . by all means take the time and trouble to participate in the activities of the industry you represent. You will make many friends and, above all, you will receive that constant lift that comes from doing something for the other fellow."

Director J. E. Kolb Dies

J. E. Kolb

Second national director of A.F.S. to die within five weeks, J. E. Kolb passed away July 22 in Peoria, Ill. He was superintendent of the pattern shop, Caterpillar Tractor Co. Like National Director Harry G. Lamker, superintendent of foundries for Wright Aeronautical Corp., Wood Ridge, N. J., who died June 17, his term of office was to expire July 28 of this year. Mr. Kolb represented the Pattern Division and was the first National Director elected from the Central Illinois Chapter.

Born in Lewistown, Ill., in 1887, Joe Kolb received his early education there and later attended Bradley Polytechnic Institute, Peoria. He served four years as an apprentice in patternmaking with the former Parlin and Orendorff Co., Canton, Ill., now a branch of International Harvester Co. In 1907, he took a position as patternmaker with the Avery Farm Machinery Co., Peoria, where he served four years. Successively thereafter he was connected with Kingman Plow Co., the former Hart Grain Weigher Co. (now Hart Carter Co.), and the former Holt Mfg. Co., which became the nucleus for the organization now known as Caterpillar Tractor Co.

Beginning as a patternmaker, he worked on the bench for one year, then was made foreman of the pattern shop. For some years his work as superintendent of the pattern shop had included responsibilty for the design and manufacture of both wood and metal patterns, the foundry machine shop, the wire room and pattern storage. He had been connected with Caterpillar for almost 35 years.

Director Kolb held membership in A.F.S. for many years and presented a number of papers and talks at regional foundry conferences, lecture courses and Annual Meetings of the Society.

Hold Meeting At A.F.S. Headquarters To Extend Cast Iron Use In Boilers

Liberalization of ASME Boiler Code provisions for use of cast iron in pressure vessels was the subject of discussion at a meeting held at A.F.S. Headquarters, Chicago, July 26 and 27. Present at the two-day meeting were members of the Committee on Revision of Section 8 of the ASME Boiler Code and Representatives of the American Society for Testing Materials. The Committee has been working with ASTM on a revision of Specification A278-44, relating to cast iron, with a view to establishing a single specification to replace A278 and A48. The meeting in the A.F.S. Library was called to correlate the work and adapt it to the requirements of the boiler code.

Presiding at the meeting was Paul Diserens, Worthington Pump & Machinery Corp., Harrison, N. J. Others present were Russell J. Allen, Worthington Pump & Machinery Corp.; R. K. Aken, Superheater Corp., Chicago; Charles O. Burgess, Gray Iron Founders' Society, Cleveland; W. L. Collins, University of Illinois, Urbana, Ill.; James S. Vanick, International Nickel Co., New York; John W. Bolton, Lunkenheimer Co., Cincinnati; Forrest Nagler, Allis-Chalmers Mfg. Co., Milwaukee; H. M. Ostertag and A. J. Karpinski, Scott Paper Co., Chester, Pa.; and W. A. Kosicki, Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

Frederick K. Vial Dies

F. K. Vial

Whiting Medalist and one of the oldest members of the American Foundrymen's Society, Frederick K. Vial, director and past vice-president of the Griffin Wheel Co., Chicago, died July 27 in Urbana, Ill., at the age of 85. An authority on the metallurgy and applications of chilled car wheels and on combustion of fuels within the cupola, Mr. Vial was for many years active on various gray iron committees of the American Foundrymen's Society and was instrumental in the formation of the Association of Manufacturers of Chilled Car Wheels in 1908, serving that organization as consulting engineer upon its inception and later as its vice-president. He was closely associated with the Interstate Commerce Commission's Department of Safety since its organization in 1910.

Mr. Vial began his career in 1887 as a rod man with the Atchison, Topeka and Santa Fe Railway. He later served as engineer for the Chicago & Alton Railway, the Ajax Forge Co., and the Chicago and Western Indiana Railroad, prior to joining Griffin Wheel Co. in 1902 as a mechanical engineer. In 1906 he was appointed chief engineer for Griffin, in charge of all manufacturing operations. Mr. Vial was later elected vice-president, and in 1917, a director of Griffin. He retired from active service with the company on January 1, 1948, but at the time of his death was in pursuit of further scientific knowledge at the University of Illinois, from which he graduated in 1885.

In 1940, Mr. Vial was awarded the John H. Whiting Gold Medal by the American Foundrymen's Society in recognition of his outstanding work in the development of cupola processes, especially that of the Griffin Hot Blast Cupola. Various other trophies were presented to Mr. Vial by other technical and scientific societies for his outstanding work. He was the holder of many patents pertaining to the design of wheels, wheel manufacturing facilities and melting processes. Among these are the desulphurization of iron, the preheating of cupola blast, improved car wheel an-

nealing facilities and improved chill control in the tread of the car wheel

Mr. Vial had written innumerable articles and papers pertaining to every phase of car wheel manufacture, the braking power of freight cars, train resistance, melting of iron and many other subjects. Mr. Vial's works may be found in engineering schools, technical and scientific libraries throughout the world.

Arrange Payment Of Canadian A.F.S. Dues Through Chapter Treasurers

EFFECTIVE IMMEDIATELY, all Canadian members of the American Foundrymen's Society may pay their annual dues in Canadian currency through the treasurers of their local chapters. This new procedure has been established as a means of making dues payment more convenient to Canadian members, particularly in view of present currency restrictions between the two countries.

American Foundrymen's Society accounts have been set up with the Royal Bank of Canada at Montreal, and with its branches in Toronto and Vancouver.

Chapter treasurers will henceforth certify payment of dues by their respective members to the A.F.S. National Office, Chicago, and will act as a source of information concerning payment of dues

Use Your Membership

ONE WAY TO GET MORE out of your membership in the Society is to participate in the work of the national committees as well as in the chapter committees.

Numbering over 100, the committees of A.F.S. provide the technical leadership for the Society and for the foundry industry. If you are interested in serving on one or more of the general interest or specific interest committees you are urged to consider carefully those to which you can contribute the most.

Your field of interest or of greatest experience may be in any of the eight technical divisions: Aluminum and Magnesium, Brass and Bronze, Education, Gray Iron, Malleable, Pattern, Sand, or Steel. In addition to these specific interest groups—each comprising a number of committees—there are the general interest committees: Chemical Analysis, Fluidity Testing, Foundry Cost, Heat Transfer, Time Study and Methods, Plant and Plant Equipment, Plaster Casting, Precision Investment Casting, Quality Control, Refractories, and Safety and Hygiene.

Indicate your interest in A.F.S. national committees by writing of your experience to the Technical Director, American Foundrymen's Society, 222 W. Adams St., Chicago 6, Ill. He will relay this to the appropriate committee chairman whose prerogative is to appoint members of his committee.

Name Bonsack Exchange Author To 23rd French Foundry Congress

ALUMINUM CASTING ALLOYS will be the subject of the A.F.S. Exchange Paper to the 23rd Annual Congress of France's Association Technique de Fonderie, to be held in the Grand Hall of the Society of Former Students of the National Schools of Arts and Crafts, Paris, October 10-11 Selected as this year's Exchange Author is Walter Bonsack, director of laboratories, Apex Smelting Co, Cleveland.

Mr. Bonsack, whose paper will be on the subject of *"Trends in Aluminum Casting Alloys,"* has just completed a term as chairman of the Aluminum & Magnesium Division of the American Foundrymen's Society. An authority on light metals and their alloys, he has contributed many articles on the subject to technical magazines and publications and is well-known as a speaker before meetings of the American Foundrymen's Society and other technical groups.

Walter Bonsack is a native of Berlin, Germany, where he studied and taught metallurgy prior to coming to the United States in 1927. He is today director of laboratories for the Apex Smelting & Refining Co., Cleveland, and has just completed a term as chairman of the A.F.S. Aluminum & Magnesium Division.

The 23rd Annual Congress of the Association Technique de Fonderie is under the joint sponsorship of France's ministers of National Economy, Industry and Commerce, National Education, and of the Secretary of State for Technical Instruction. Dr. Marcel Ballay, president of the Association, has issued an invitation to all members of the American Foundrymen's Society to attend the Congress.

Dr. M. F. Pisek Named Vice-President Of International Committee Panel

PANEL OF OFFICERS of the International Committee of the Foundry Technical Associations is now complete with the naming of Professor Dr. Mont. Frant. Pisek, representing the Technical Foundry association of Czechoslovakia, as vice-president. Previously announced as president was Rene Deprez, president of the Belgian Foundry Technical Association; Tom Makemson, secretary of the Institute of British Foundrymen, is secretary of the International Committee of Foundry Technical Associations.

Objects of the Committee are to prepare a calendar of International Foundry Congresses and Foundry Exhibitions and to promote cooperation between the various associations represented, particularly to insure free exchange between the member foundry technical associations of results of researches, documents and technical journals that are of world-wide interest.

SCHEDULE EIGHT A.F.S. REGIONAL FOUNDRY CONFERENCES IN 1949-50

EIGHT REGIONAL FOUNDRY CONFERENCES are planned for the 1949-50 season. Held this year for the first time will be the New York State Regional Foundry Conference, November 25-26 at Syracuse University. Other conferences scheduled for the latter part of this year or early in 1950 are the New England, Michigan, Wisconsin, Birmingham, Ohio, Purdue and Metropolitan.

The first New York State Regional Foundry Conference will be sponsored by the Western New York, Eastern New York, Rochester, and Central New York Chapters. Tentative plans for the Conference include technical sessions the morning and afternoon of November 25 and the morning of the 26th, which will be held at Syracuse University's Thompson Road campus. On the program are two luncheons and a dinner at the Onondaga Hotel, Syracuse.

Also scheduled for this fall is the New England Regional Foundry Conference, to be held October 7-8 at Massachusetts Institute of Technology, Cambridge. Chairman is Arthur F. Dockry, H. & B. American Machine Co., Pawtucket, R. I. Conference sponsors are the A.F.S. Student Chapter at M.I.T., the New England Foundrymen's Association, the Boston Chapter of the Non-Ferrous Founders' Society, the Connecticut Foundrymen's Association and the Connecticut Non-Ferrous Foundrymen's Association.

The A.F.S. Metropolitan, Philadelphia and Chesapeake Chapters will jointly sponsor a Regional Foundry Conference to be held at Stevens Institute of Technology, Hoboken, N. J., October 21-22. General chairman of the Conference is Harold Ullrich of Sacks-Barlow Foundry, Newark, N. J.

The Michigan Regional Foundry Conference, previously scheduled for early November, will be held October 28-29 at Michigan State College, East Lansing, and is sponsored by the Central Michigan, Western Michigan, Saginaw Valley and Detroit Chapters.

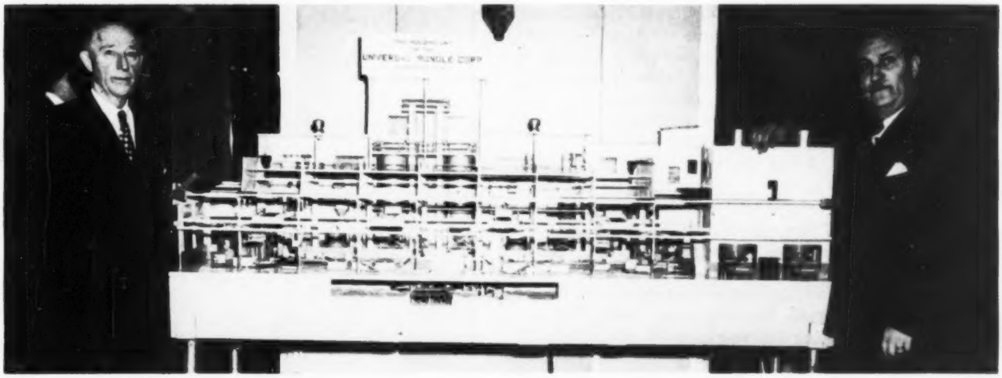
The Ohio Regional Foundry Conference will be held March 10-11 at the Netherland Plaza Hotel, Cincinnati, and will have as its host the Cincinnati District Chapter. Other Chapters sponsoring the Conference are Northeastern Ohio, Canton District, Central Ohio and Toledo. E. H. King, Hill & Griffith Co., Cincinnati, has been appointed general Conference chairman, and H. R. Rost, Semet-Solvay Division, Allied Chemical Corp., Cincinnati, treasurer.

A Regional Foundry Conference to be held at Purdue University, Lafayette, Ind., has been tentatively planned for November 3 and 4. An outstanding feature of the Purdue Conference will be a premier showing of a film on malleable founding by the Malleable Founders' Society.

Members of the Eastern Canada Chapter have received questionnaires from the Chapter asking them to vote on whether to hold a Regional Conference this September. If the members favor it, the Conference will be held at St. John, New Brunswick, Nova Scotia.

As tentatively planned, the Conference will have four sets of group meetings covering simultaneously five fields of foundry interest and two general Conference meetings.

Planned for the 1949-50 season but not yet definitely established as to dates and locations are the Wisconsin Regional Foundry Conference, sponsored by the Wisconsin Chapter; and the Birmingham Regional Foundry Conference, sponsored by the Birmingham District Chapter. Information as to dates, locations and programs of these Conferences will be published in subsequent issues of AMERICAN FOUNDRYMAN.



An outstanding exhibit at this year's Wisconsin Regional Foundry Conference, held in Milwaukee, was this model of two bath tub molding units built to an exact scale of 3/8 in. to 1 ft. by Julius Muller, foundry superintendent, and Harold Anderson, pattern department superintendent of the Universal-Rundle Corp., Milwaukee. (Photograph courtesy Walter V. Napp, Badger Fire Brick & Supply Co.)

DESIGNING

cast iron crankshafts and centerframes for diesel engines

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MANY NEW TOOLS are available to assist designing engineers in the design of parts made of cast iron. As a result, engine parts may be designed to properly utilize the strength qualities of the metals being poured in modern foundries. The two tools most used in our engineering are "stresscoat" and electrical resistance type strain gages.

Stresscoat is a lacquer so brittle that it cracks under a moderate amount of strain, thus showing the location and direction of the strains when the casting is loaded and at the same time giving a fair approximation of their magnitude. The resistance type strain gage is a small wire grid whose electrical resistance change with strain may be measured by a small portable galvanometer. These gages are very sensitive and give accurate results.

We mention the word strain above (used here as synonymous with "unit strain") although it is more common to think in terms of stress. Therefore, except for purposes of comparison, we use strain only as a measurable quality which may be converted into stress. Conversion into stress, for cast irons, must not be accomplished by using the modulus of elasticity as a factor since the stress-strain curve departs from a straight line at low stress values. The shape of the curve also varies for different analyses and casting cooling rates. The best practice is to determine the stress-strain curve of a specimen taken from the part being tested.

When cast iron was first considered for diesel engine crankshafts, the design shape and size were determined by normal stress calculations. The allowable stress for the type of material intended was applied to normal bending and torsion formulae, and the crankshaft size, in the way of crank pin diameters, journal diameters, crank web thickness and width, was determined. This resulted in a design similar to conventional forged steel shafts except that cored lightening holes and unmachined crank webs were used. Figure 1 shows such a design. The broad web resulted because it was desired to maintain short cylinder centers.

Stress Measuring Tools Applied

Data from other studies were available to determine stress concentration at the crank pin fillet for steel shafts, but such data were meager for this particular type of inoculated cast iron. Therefore, it was decided to apply the newer stress-measuring tools and determine whether or not stress concentration would raise the nominal stress to values dangerously close to the endurance limit of the cast material. Laboratory tests had already determined that the endurance value of this particular inoculated cast iron was a lower percentage of the tensile strength than that usually found in forged steel.

Stresscoat was applied to determine the most highly strained region. A single crank taken from a multithrow shaft was loaded, as shown in Fig. 2, in a standard hydraulic testing machine. The fixture was designed as shown to allow free axial deflection, thus simulating well lubricated journal bearings. High stress concentration, as anticipated, was found in the

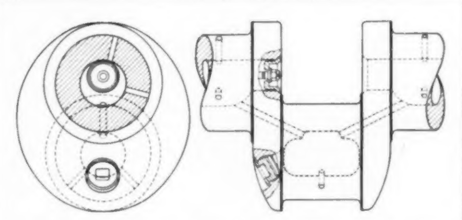

Fig. 1—Sketch of original cast crankshaft design.

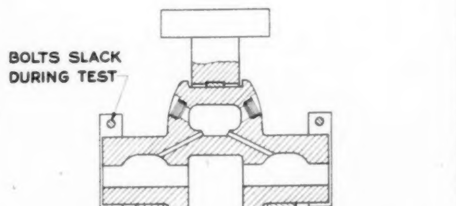

Fig. 2—Single crankthrow in the testing fixture.

NOTE: This paper was presented at the Ohio Regional Foundry Conference, sponsored by the Ohio Chapters of A.F.S., at Ohio State University, Columbus, Ohio, Mar. 11, 1949.

crank pin fillet. The stresscoat was then removed and ¼-in. gage length SR-4 strain gages were applied in locations as shown in Fig. 3.

Load was applied in increments, and the strain in each gage was measured by the SR-4 strain indicator. Reduction of the crank pin fillet stress concentration was obtained by removing metal from the inner side of the crank web, thus increasing the effective radius of the crank pin fillet which forced the stress flow through the web to be distributed over a greater portion of the web.

Four different contours were tested. These are shown in Fig. 4, which is a section through the crankthrow centerline. Number 1 is the original design, and the subsequent contours were obtained by hand grinding the original crank throw. The contours became shallower on both sides of the center plane and ran out to the original crank web surface at between 45° and 55° from the center plane.

Since this work was comparative only, a tensile stress-strain curve was not obtained. The results shown in Fig. 5 are, therefore, given in strain instead of stress, and are plotted radially from the crank pin surface. Contour 2 did not have much effect. Contour 3 reduced the strain by 15 per cent. Contour 4 showed no improvement over 3, perhaps because it reduced the cross section of the web too much. Strain gages on the broadest part of the crank web had shown very low strain levels, so the crank web width was reduced materially. Surprisingly, no noticeable change occurred at the fillet.

The results of the foregoing tests were applied to a complete redesign, producing a design shape as shown in Fig. 6. Changing the oil hole drilling made it possible to use straight cylindrical cores. This type of study, although far from being elaborate, gave a reasonable basis for redesigning for less stress and less weight. Many of us have seen similar results obtained by others in the design of cast crankshafts. For certain applications it is possible to cast-on counterbalances, saving the expense of precision machining of the crank webs for bolted-on counterweights.

Much material has been published on the subject of substituting fabricated welded steel for cast members used in engine framework. The designers of many years ago designed the frames of internal combustion engines for very low stresses. Such designers

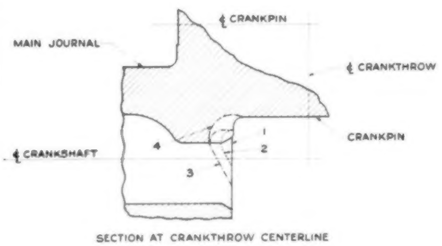

Fig. 4—Crankshaft section at crankthrow centerline showing the stress-relieving contours.

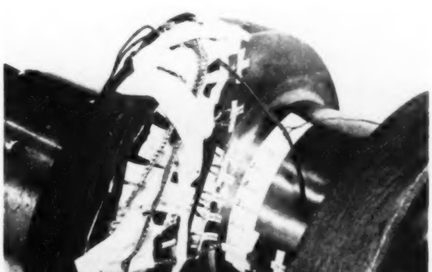

Fig. 3—Strain gages placed on the crankthrow.

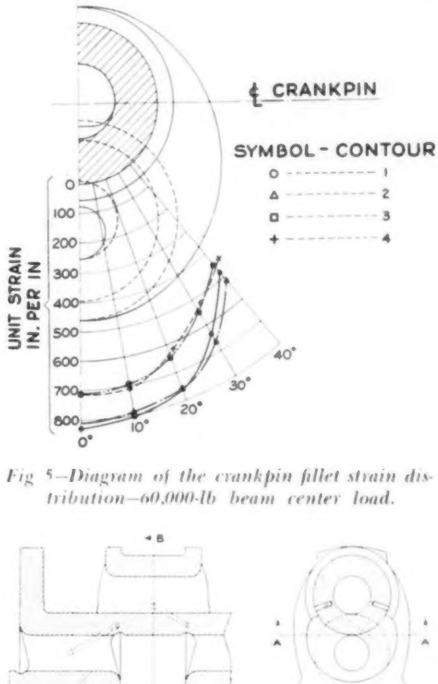

Fig. 5—Diagram of the crankpin fillet strain distribution—60,000-lb beam center load.

Fig. 6—Sketch of modern cast crankshaft design showing stress-relieving pocket.

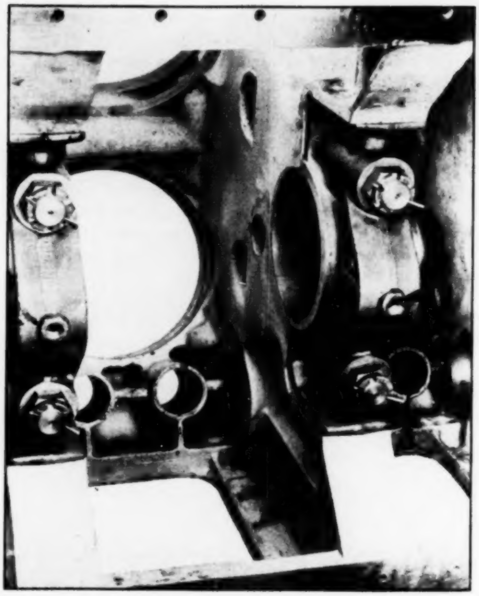

Fig. 7—Inside view of a V-type diesel engine frame.

were guided almost entirely by satisfactory performance of similar engine frames. These castings were bulky and consisted of heavy walls to support the loads imposed on the frame by the pressures within the power cylinders. It was easy to substitute welded steel for such cast designs, using plate and rib construction and occasionally certain extruded shapes to produce the desired result. In many cases a saving was claimed in both over-all weight and actual cost of the finished frame.

In planning the design for a new medium high speed, high output, V type diesel engine, it was decided to consider inoculated cast iron. Many similar designs are now in successful commercial use, but in nearly all cases the engine framework is a welded steel construction. This particular frame was designed very light, with some ribs being only ¼-in. thick. The transverse structure at each of the main bearings is of an unusual double-wall construction over the more highly loaded central region. The crankshaft was underhung in the frame.

Figure 7 is a view of the engine framework between two of the main bearing caps. It shows the transition of the transverse wall from single thickness into the double construction. The bearing cap is held by two through-bolts. The upper nut is carried in a semicircular space which is called the nut pocket. A sample casting was made and completely machined.

In such a complicated structure it was difficult to

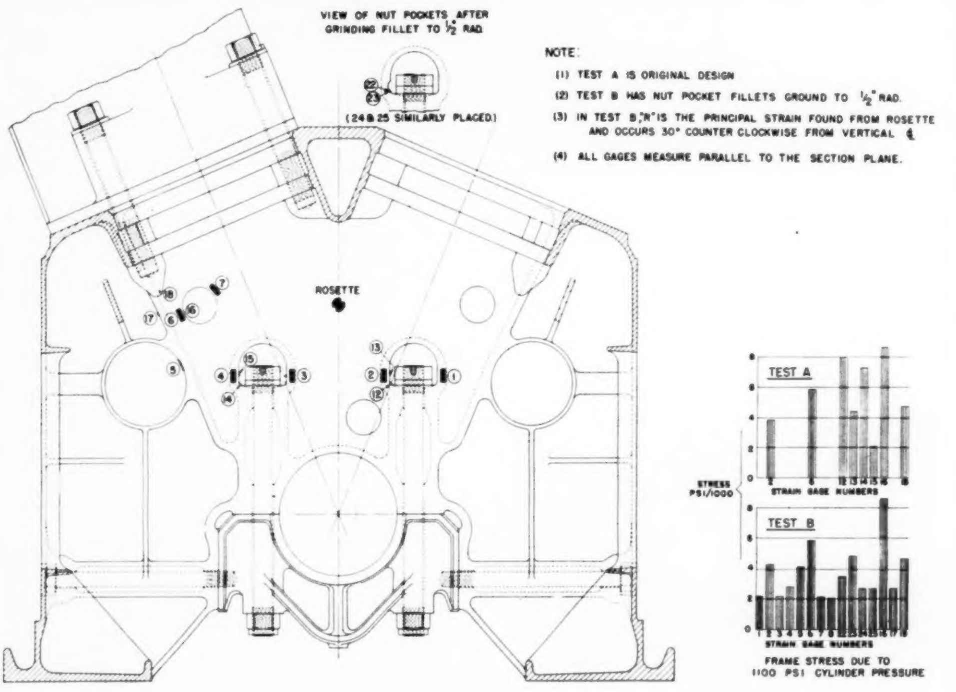

Fig. 8—Strain-gage locations and test results on V-16 engine frame.

decide where to place the strain gages. The use of stresscoat to determine gage placement would have been helpful, but the frame was so large that the tests had to be done where atmospheric conditions were too variable to depend on consistency in the way of stresscoat. Therefore, the gages had to be located by judgment alone.

Figure 8 shows a transverse section through the frame looking at the wall to which the gages were attached. There were seven gages of 13/16-in. effective length, seven of ¼-in. effective length, and one 13/16-in. rosette. Figure 9 shows the experimental setup. Loading was obtained by fluid pressure in the regular engine cylinder. A straight shaft was used, in place of a crankshaft, with a special spacer at the top of the connecting rod in order to locate the piston at normal top dead-center position.

Light lubricating oil under controlled pressure was supplied by a diesel fuel pump and entered the cylinder through the injection nozzle. Cylinder pressure was observed on a standard test gage and the unit strain was read directly from the SR-4 strain indicator. The readings taken indicated the effect of an explosion type cylinder pressure because the connecting rod was on the cylinder centerline.

Strain Proportional to Pressure

Strain values were recorded at several pressures and strain was found to be nearly proportional to pressure. The strain values at 1100 psi cylinder pressure have been converted to stress by means of a stress-strain curve, and are shown in bar-graph form at the side of Fig. 8 as Test A. The nut pocket fillets on the side toward the cylinder (gages 12 and 14) and the edge of the upper core support hole are two regions having much higher stress than their surroundings. In order to improve the fillet stress its radius was changed from ¼-in. to ½-in. by using a portable grinder.

The altered fillet is shown on the displaced partial view above the main section in Fig. 8. New gages were placed and Test B was run. The fillet stress was reduced from 8000 to less than 5000 psi. The tensile stress-strain curve mentioned previously was obtained by cutting a flat specimen from the frame casting wall where the wall was only ½-in. thick. Suitable fixtures were used to hold the specimen in a standard tensile machine, and the stress-strain curve determined so that the strain readings observed during the test could be readily converted to stress.

Fig. 9—Setup for strain testing on V-engine frame.

Before the frame was put into production, the nut pocket fillet radius was changed to ½-in. The upper core support hole could not be reduced in diameter so it was moved to a place having a lower general stress level and a strengthening bead was added to its circumference. The values of maximum and minimum stress occurring during an engine pressure cycle were compared to an estimated endurance limit curve for the material used and a safety factor of 2.53 was derived. This value was considered adequate and subsequent usage in many engines proved that the approach to designing a frame in this manner resulted in the economical use of cast materials for minimum weight engines at minimum production cost.

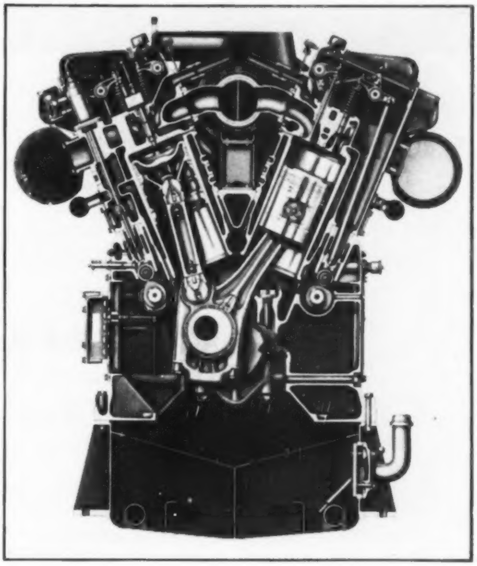

Fig. 10—Cross-sectional view through the V-engine.

It will be interesting to some readers to know that the complete engine using cast iron cylinders and cylinder heads, cast iron pistons, and a cast iron frame in a V-12 arrangement weighs 28,000 lbs. Figure 10 is a cross section of the engine. The engine is rated 1200 hp at 1000 rpm.

A similar development in lighter construction occurred on a larger bore and stroke medium speed in-line engine. Very early in the last war production was planned on the basis of a welded steel engine in order to provide a shockproof unit for the military services. Experts in weldment design were employed to produce the engine frame shown in Fig. 11. The result is obviously a frame economical to machine.

After the war a cast iron counterpart, employing medium strength inoculated iron, replaced the steel frame because of weight and cost. This frame is shown in Fig. 12. The finished cost (after machining)

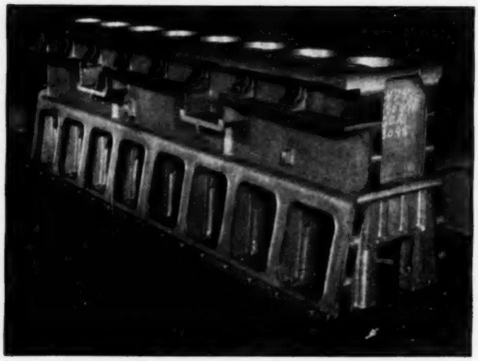

Fig. 11—Welded steel vertical diesel engine frame.

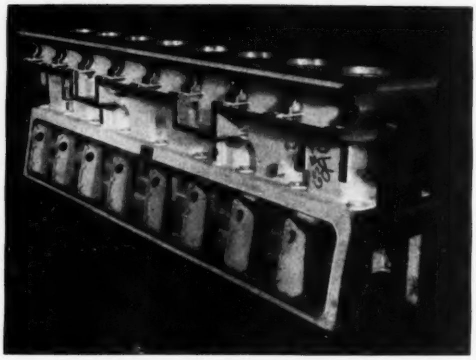

Fig. 12—Vertical engine frame designed for cast iron.

was 46 per cent of the cost of the welded frame. The weight was reduced 14 per cent, making the cost per pound 53 per cent of the cost rate of the steel frame. This is a remarkable cost reduction (and weight reduction) even though the metal removed by machining was increased from 16.2 per cent of the rough weight for the steel frame to 22.7 per cent for the cast frame.

The author is convinced that it is possible, by careful design, to use cast construction to obtain medium weight modern diesel engines rather than resort to welded steel fabricated framework.

A.F.S. RESEARCH PROJECTS

Research projects of A.F.S. are conducted under definitive contracts with various institutions which have the necessary personnel and mechanical facilities. Reports on each project are required at regular intervals.

"Research" is just that—*search* and *re-search*. It is not like production where reasonably well-known materials, proved methods and engineered designs are employed to turn out salable products. Research commences with an idea and many unknown factors, all of which must be examined by trial and error before the actual idea itself can even be approached.

Months or years may go by before a technique can be evolved which might be expected to shed light on the problem. Finally, a great many tests must be run before the researcher can arrive at useful conclusions. These must be interpreted and further analyzed in terms of actual production for the eventual benefit of the industry.

Results of A.F.S.-sponsored research, when in publishable form, are available to everyone. Quarterly progress reports and visits and consultation with the researchers keep the committees directing the work informed on project developments. Following the lead of the Sand Research and the Heat Transfer Projects, annual reports on the various researches under Society sponsorship will become a regular feature of the Annual A.F.S. Convention and will subsequently be published in TRANSACTIONS OF A.F.S. Some of the annual reports will also be preprinted.

Title of Project	Group Directing Work	Institution
Hydraulics of Light Metal Flow into Molds	Research Committee, Aluminum and Magnesium Division	Battelle Memorial Institute
Fracture Test as an Index of Melt Quality	Research Committee, Brass and Bronze Division	University of Michigan
Centrifugal Casting of Light Metal Alloys	Centrifugal Casting Committee, Aluminum and Magnesium Division	Canadian Bureau of Mines
Influence of Heredity on Coke Behavior in the Cupola	Cupola Research Committee	U. S. and Canadian Bureaus of Mines, Ford Motor Co., and Eaton Mfg. Co.
Fundamentals of Heat Flow During Casting Solidification	Heat Transfer Committee	Columbia University
Selective Hardening of Pearlitic Malleable Iron	Research Committee, Malleable Division	University of Michigan
High Temperature Properties of Molding Sands	Research Committee, Sand Division	Cornell University
Relation of Cores to Hot Tearing	Research Committee, Steel Division	Armour Research Foundation

YOUR STAKE in ENGINEERING EDUCATION

George K. Dreher
Executive Director
Foundry Educational Foundation

In spite of wholehearted cooperation and interest of the foundry industry in engineering education and the program of the Foundry Educational Foundation many of us have not stopped to take stock of the real reasons for this need and its place in our planning for the future of our industry. This article does not cover every reason, but it does offer a summary of the reasons why the program was inaugurated. It will make the reader more aware of his part in the foundation program as well as give some insight into the benefits which can be anticipated.

Frank C. Hockema, vice-president of Purdue University, made the following statement in the opening paragraphs of an address before the American Society for Engineering Education annual meeting held in Troy, N. Y., June 22:

"In the broad sense, education includes all experience, all learning, all growth, and all self-development . . . The danger is not that we may have too much education, but that we may obtain the wrong kind. To provide the right kind and the right amount of education for each citizen is, therefore, vitally important . . . Education must lead the way if we believe in that old axiom, 'What we want in the nation, we must first put in our schools.'"

Dr. Hockema was covering education in a broad sense but his thought is particularly significant to us of the foundry industry. It is common knowledge within the industry that the caliber of foundry instruction in engineering colleges has been for the most part at a sub-engineering level. The majority of such instruction leads "downward and backward" with respect to the foundry industry.

Few Schools Stress Foundry Education

Professor George J. Barker, University of Wisconsin, acting as head of Committee 4-K—Recruiting of Engineers—of the American Foundrymen's Society Educational Division, conducted a survey in early 1948 among major engineering schools in regard to foundry education. Only 40 of the 125 schools reported some foundry taught as a lecture and 29 of these offered some laboratory work. If the writer's experience can act as a gage, then it is to be doubted that more than six or eight of these presented the foundry process in a favorable light alongside other methods of fabrication.

The metallurgical and mechanical excellence possessed by a large part of the annual cast tonnage could not possibly be indicated by the crude laboratory methods practiced. Students in these courses could not help but regard the foundry as an unreliable process not given to technical and engineering methods. Their thoughts, quite naturally, were diverted towards other methods presented in a more favorable light and for which a wealth of text and reference material was available to the embryonic designer. No such literature is available today adequately covering the use and design aspects of foundry products.

Foundries Lack Interest in Education

The above-mentioned committee report intimates, however, that the Universities were interested in further knowledge and activity in the foundry field. It was implied that a lack of interest on the part of the foundryman was primarily responsible for the relatively meager instruction offered in many of the schools. A similar attitude was revealed in a survey reported by Arthur J. Tuscany, executive secretary, Foundry Equipment Manufacturers Association, which appeared in the February, 1946, issue of American Foundryman under the title *"Foundry Industry and Educational Institutions."* Here again, interest was indicated if the technical data and support of the industry could be developed.

325,000 Potential Castings Customers

This lack of attention to the basic casting process has characterized the education of the 325,000 engineers in the nation who now design, specify and control the use of our products. *The real customers of the castings industries are these engineers.*

In 1948 some 32,000 engineering graduates joined the above group. The next year saw 48,000 added and 1950 will find in excess of 50,000 more. The years to follow will see lesser numbers in the graduating classes but whether large or small they are constantly enlarging the group of men responsible for the selection and use of metal products. If present rate of growth in the engineering profession continues, we can expect some 450,000 to be active in 1958. It is to this incoming group that the industry must present its capabilities in order to be assured of equal consideration for castings in the machinery and equipment of the future.

This theme has prevailed in the Foundry Educational Foundation schools and some few other universities to an increasing extent during the past two years. As the idea spreads we can look forward to more and more understanding and use of foundry products by graduating engineers. The area served by the Foundry Educational Foundation schools presently contains over 70 per cent of the engineers now active

in the profession, according to the Engineer's Joint Council report of its 1946 Survey.

To deal, service and progress with this engineering influence on our future we must have parallel ability within our own organizations. The relative size of the foundry industry in the manufactured goods field would indicate that we should absorb 3.25 per cent of the engineering graduates (400,000 foundry employees/12,393,000 total manufacturing employees). This would mean that the foundry industry should employ some 1560 engineers per year at present levels or about one-half that when the pendulum swings back to normal. While a figure such as this is not entirely accurate it is nevertheless a good gage.

In 1948 the Foundry Educational Foundation registered 38 graduates into the industry, and in 1949 there were 43 more. There are undoubtedly many others about whom we do not know but it would be difficult to account for more than 100 in 1948 or more than 75 in 1949. Comparing these actual figures with the 1560 which should be our annual employment on the basis of our industry's size, we find that 6.4 per cent and 4.8 per cent of this par were actually employed.

The individual foundryman can bring this fact closer to home by looking at the ability in the plants of his own customers and the engineers who specify the castings he makes. Until this gap in ability is corrected, many foundry organizations will of necessity be required to play the role of underlings rather than those of partners in engineering progress. Much more could be said, but this is the second reason for an engineering level educational interest. The third grows out of the above reasoning and has to do with the present technology and markets of the industry.

Foresee Expanding Castings Market

The present annual business volume of our industry is about $5 billion. This compares to a total metal goods bill of $100 billion. Many are optimistic concerning the possible market expansion for foundry products. By taking full advantage of the benefits which the casting process offers we can capture and recapture product lines which should logically be castings. *A one per cent shift in the annual metal goods total toward the foundry would be a 20 per cent gain in our own volume.*

Guided and intelligent exploitation are required to make the above fact a reality. Foundry processes permit the most efficient conversion of raw material and scrap into usable goods. In most cases, the foundry will use scrap generated in the local areas, thereby preventing long freight hauls of bulky material. The shipment of solid ingot and pig is less costly and more convenient than rolled shapes. Parallel to this is the economic saving through shorter hauls of finished castings by reason of the geographic distribution which our industry enjoys.

No other method of fabrication permits the efficiency of design and strength possible with castings and certainly nothing approaches the intricacy which a casting can possess. Attempts to find other ways of achieving these advantages have met with failure. The non-directional properties of castings permit greater flexibility in design as it is not necessary to compensate for cross stresses with added members in the structure. Cast surfaces have proved superior in wear resistance and are peculiarly more resistant to corrosion. These are further benefits in the view of the designer and user of castings. More pleasing beauty of line and form which can be incorporated into cast products is another advantage.

We should also bear in mind the engineering and managerial efficiency which castings permit. It would be difficult to find many applications where a casting could be displaced by another single member. Usually the replacement requires a multiplicity of parts to be joined together. In contrast, the change to a casting usually eliminates many pieces or combines them into an easily handled single unit. All this tends to make for less engineering detail, less complicated ordering and inventory procedure and less floor space per unit of production.

Industry Failings Must Be Overcome

We cannot capitalize on these benefits unless certain present failings of the industry and the foundry process can be overcome. Some of them will require technical advances and others the mental stamina needed to maintain standards of procedure in the foundry. A few of the more obvious factors can be cited as examples. Reliability of castings after they leave the foundry is one of the greatest. As customer rejections diminish, a more frequent use of foundry products will develop. Parallel to this, we might place the machinability problem of the customer. Recent tests at a large automotive plant revealed that some castings gave 120 times the tool life of others. Freedom from defects and a corrected structure accounted for the difference.

Strangely enough, not only will such improvements satisfy and sell a customer, but they also reduce shop costs while effecting an overall product improvement. W. B. McFerrin, Electro Metallurgical Co., Detroit, in a talk before the A.F.S. Cincinnati Chapter last year, showed that a one per cent saving in shop scrap would amount to a $30 million saving to the industry each year (1 per cent of 15 million tons at 10c/lb shop cost). This amount would pay the annual salaries of several thousand young engineers who could be developed to master such problems. Many plants could well afford to add such a man for scrap and quality control and still make a profit.

Fewer Accidents = Insurance Savings

Space does not permit a proper analysis of the benefits which an improved supervisory and managerial staff might develop in reducing expensive labor turn-over, nor of the savings which might accrue through reduction of industrial accident frequency rate from its present high point of 34 down to the normal industrial levels of around 12 to 15. A saving of one-half in our present industrial insurance bill is pleasant to anticipate and can be accomplished with a staff which will engineer and religiously apply safety on the job.

Not only does the bugaboo of scrap losses haunt the foundry manager, but few organizations attain the excellence which is inherent in the products of a

foundry. The advent of beryllium copper was surrounded by an aura of "super-metal." It never reached the claims made for it due to a lack of control and realization of the difficulties which had to be overcome in the handling of this alloy. The claimed properties were rarely reached and its potential market was restricted by failures and poor performance. In spite of this, some firms did develop methods which reached more than 190,000 psi ultimate tensile strength (about double the usually attained values).

The industry is presently in a comparable situation concerning nodular iron. Some believe that close patent control in the hands of a friendly company will avoid a black eye for the product which uncontrolled production and promiscuous application might possibly create.

Strict Quality Control Needed

Accuracy in cast products was clearly demonstrated during the war when aircraft and gun parts were successfully held to variations of 0.005 in. and less. The production turmoil of the postwar world resulted in a reversion to less careful practices by some foundries. To regain some of the business lost through such practices will take years. The tooling and technique which can insure full realization of accuracy in castings are natural problems for attack by the engineering method. Sufficient proof of this is evident in the amazing accuracies now maintained by casters of automotive products where cavities are held to plus or minus 0.04 per cent and other dimensions are maintained on a similar basis.

Accuracy has taken even greater strides in the field of precision investment castings now being made by some of the older foundry organizations as well as by many new plants which have sprung up in this field. In manufacturing parts, the process has already captured a new market for the industry and is rapidly becoming the basis of intricate designs in machinery by replacing parts on which machining costs would be prohibitive. Similar results are being attained in the permanent mold casting of iron and non-ferrous alloys and non-ferrous alloys continue to be developed into more accurate products by the die casting method. These products represent only a small part of the annual cast tonnage—the point is that greater accuracy is economically attainable in sand castings.

The use of mechanical blasting equipment, straightening dies and presses, pickling solutions and paint spraying has done much to improve the appearance and salability of cast products. Some plants have

(Continued on Page 71)

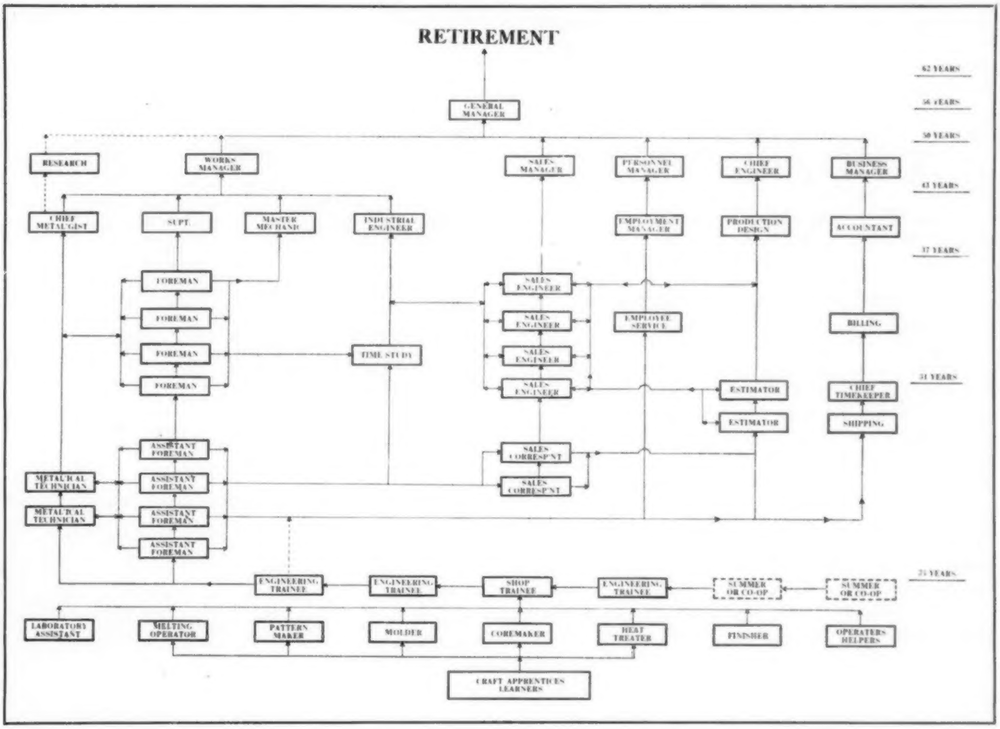

Chart shows possible avenues of progress a trainee might follow upon concluding induction program. This hypothetical organization would comprise some 350 persons. For larger companies, a more detailed breakdown would be needed and for smaller companies a condensation would be necessary. The ages indicated at the right of chart are purely an approximation and would actually vary somewhat between firms.

variables in producing

NODULAR GRAPHITE CAST IRON

by magnesium treatment

G. E. Holdeman
and
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Production of cast iron with a nodular graphite structure first obtained widespread publicity in this country through the presentation of a paper by H. Morrogh[1] at the 1948 A.F.S. convention in Philadelphia. Mr. Morrogh's work, which was sponsored by the British Cast Iron Research Association, deals with the production of the nodular structure through the ladle addition of cerium (mischmetal), preferably followed by a small addition of silicon.

The cerium addition is effective in markedly increasing the transverse rupture stress, tensile strength, deflection and toughness. Brinell hardness is also somewhat increased. On the other hand, the cerium treatment has some technical limitations, the most serious being that it is apparently effective only on hypereutectic irons. From an economical standpoint, it is more expensive than treatment with magnesium.

During the discussion of Mr. Morrogh's paper it was announced by Thomas H. Wickenden, of the International Nickel Co., that they had developed a process which would produce a spheroidal graphite structure in the as-cast condition. The process "is based on the introduction into the iron of a small but effective amount of magnesium or a magnesium containing addition agent, such as Ni-Mg alloy."

Many Investigations Undertaken

The American Cast Iron Pipe Co. has investigated both cerium and magnesium treatments, finding that of the two magnesium gives better results from several standpoints. Excellent discussions of the properties obtainable will be found in two recently published articles by the above mentioned companies which appear in the Feb. 1949 issue of American Foundryman[2] and the Feb. 17 and 24 issues of *Iron Age*.[3]

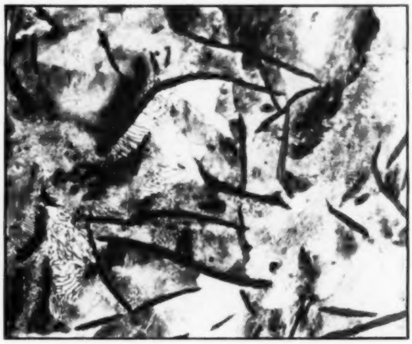
The Dow Chemical Co. has also been conducting investigations involving the use of magnesium to obtain spheroidal graphite in cast gray iron, and it is the purpose of this paper to discuss some of the variables encountered in this work.

Figure 1 (above) illustrates the typical graphite structure found in gray iron. At the right is shown a striking comparison of the structure found in magnesium treated cast iron. It will be noted that the graphite in the treated iron is completely spherulitic. Figure 2 is of interest because microradiography is used to illustrate the presence of nodular graphite.

As a generality, we may say that tensile strengths of 70,000 to 120,000 psi have been obtained in irons which normally run from 20,000 to 40,000 psi. By proper composition control, considerable elongation may be produced in the as-cast state. Simple heat treatments (such as one hour at 1650 F) have given elongations of 20 per cent while still retaining tensile strengths of 70,000 psi. Toughness is also materially increased. Cast iron properly treated with magnesium retains good foundry and machining characteristics.

It is possible, however, to get a poor magnesium treatment as a result of the addition of too much or too little magnesium. Too much magnesium will produce an unduly hard iron, while too little magnesium will not give completely nodular graphite in the iron. Figure 3 illustrates cast iron treatments with (1) too little magnesium (0.019 per cent); (2) magnesium in the recommended range (0.08 per cent); and (3) too large an amount of magnesium (> 0.4 per cent). So far, indications are that the optimum range is 0.03 to 0.1 per cent magnesium retained.

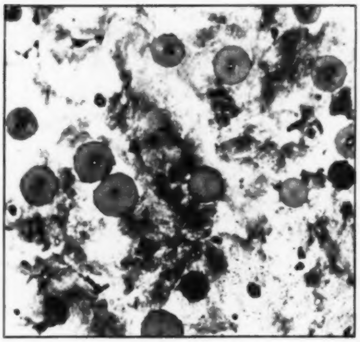
The treatment is not as simple as just adding mag-



Flake graphite in untreated cast iron.

Fig. 1 — Typical graphite structures in untreated and magnesium treated cast irons.

Nodular graphite in magnesium treated cast iron.



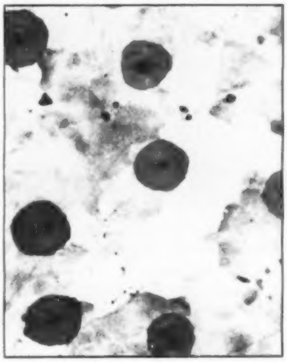
This paper was presented at an A.F.S. sponsored session of the Western Metal Conference, at Los Angeles, April 13, 1949.

nesium to iron. Magnesium boils at 2007 F and is reactive at temperatures of liquid iron. Treatment with pure magnesium will be found to be quite spectacular due to the brilliant white light and white smoke produced by burning magnesium. Attempts to plunge this material into a ladle of cast iron or to pour cast iron on magnesium will undoubtedly result in blowing metal out of the ladle.

It has been found, however, that alloys of magnesium with other metals, particularly copper and nickel, may be used to reduce the reactivity. The 50-50 alloys of either copper or nickel are still quite spectacular when added to the surface of the cast iron, but a 20 magnesium-80 copper is comparatively quiet, and the 20 magnesium-80 nickel alloy is only slightly more reactive. Magnesium-copper alloy (10-90) burns with only a short flame on the surface of the iron, while the 10 magnesium-90 nickel also has a low rate of reactivity.

Figures 4 and 5 illustrate the difference in activity between 50-50 nickel-magnesium and 80-20 copper-magnesium alloys. In both cases, the pictures were taken immediately after the alloy addition. The action is of very short duration, and with the exception of color not much different from some types of ladle additions commonly used in the iron foundry. Ordinarily a steel cover plate is used after the addition of 50-50 copper-magnesium, and any spattering and flash is much more confined.

A number of alloys have been investigated as possible means of introducing magnesium into cast iron.

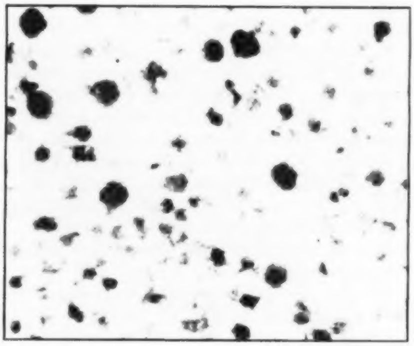


Insufficient magnesium. Mg.—0.019 per cent.

Fig. 3—Effects of magnesium treatments on graphite structures of cast iron.

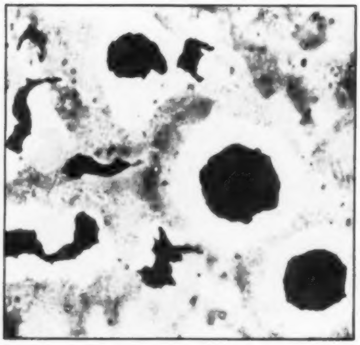
Satisfactory treatment. Mg.—0.08 per cent.

Overtreatment. Mg.—>0.4 per cent.



Microradiograph. X100.

Fig. 2—Photomicrograph and microradiograph of a nodular cast iron. Mg analysis—0.01 per cent.

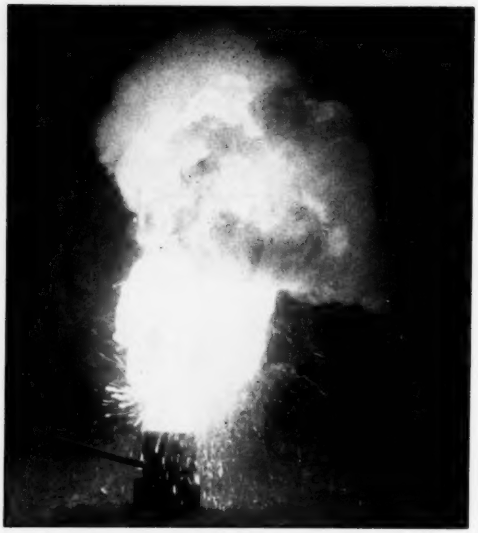


Photomicrograph. X250.

Table 1 shows a partial list of these alloys, along with the approximate alloying efficiencies encountered. It will be noted that in both the copper-magnesium and nickel-magnesium alloys the alloying efficiency as regards magnesium increases as the percentage of magnesium in the alloy decreases. The reactivity decreases in a like manner with the decrease in the magnesium content.

An alloy of 20 magnesium-80 antimony was found to be very quiet when added to the surface of cast iron. In fact, immersion of this alloy was possible without noticeable reaction. Unfortunately the alloying efficiency for magnesium was low and the graphite structure was of an unusually coarse type (Fig. 6).

Magnesium-aluminum alloys show some promise as a means of adding magnesium. With $Mg_{17}Al_{12}$ (about 55 magnesium and 45 aluminum) good alloying and nodulizing (see Fig. 7) were obtained, but the re-



activity was high. A 20 magnesium-80 aluminum alloy was found to be less reactive, but was also less efficient both as to magnesium retention and producing the nodular structure.

A 90 magnesium-10 lithium, while moderately high in reactivity, was considerably less so than commercial magnesium. Figure 8 shows that nodular graphite was successfully produced through additions of this material. Magnesium silicide (63-27) is too reactive to be of much current interest.

Magnesium-zinc alloys in either the 50-50 or 25-75 compositions did not, in preliminary tests, appear to be particularly suitable because of high reactivity and low magnesium retention. No nodular graphite was produced. The same may be said of 50 magnesium-35 copper-15 zinc. Magnesium-bismuth alloys are also quite reactive and, as shown in Fig. 9, do not readily produce nodular iron.

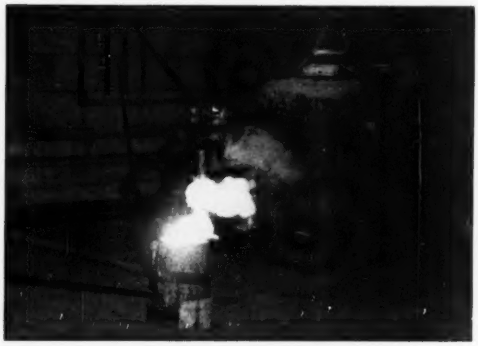
Although all alloy possibilities have not been exhausted by any means, indications so far definitely favor the copper- or nickel-magnesium compositions in which the magnesium content is not more than 30 per cent. This considers both the efficiency of the magnesium and the reactivity.

TABLE 1—ALLOYING EFFICIENCIES OF VARIOUS MAGNESIUM ALLOYS

Alloy		Approx. Alloying Efficiency, per cent
Mg-Cu	50-50	5-8
	30-70	8-15
	20-80	9-15
	10-90	20-25
Mg-Ni	50-50	5-8
	20-80	25-40
	10-90	30-40
Mg-Sb	20-80	<5
Mg-Al	55-45	15
	20-80	8
Mg-Li	90-10	5
Mg-Si	63-27	3-10
Mg-Zn	50-50	<5
	25-75	<5
Mg-Cu-Zn	50-35-15	<5
Mg-Bi	50-50	5
	15-85	10
Cell Magnesium	100	<5

Fig. 4 (left)—Reaction of 1 per cent magnesium addition as 50-50 Mg-Ni in 20-lb cast iron melt.

Fig. 5 (below)—Low reactivity is obtained with 0.25 per cent magnesium addition as 80-20 Ni-Mg.



In addition to the effect of alloy composition on reactivity, several other points should be brought out with respect to procedures for adding magnesium alloys to cast iron. In general, the alloys used for magnesium additions should be crushed before addition to the cast iron. This is particularly necessary in the case of the more reactive alloys. Particle sizes of 1/8 to 1/4 in. have been found to be reasonably satisfactory.

No attempt should be made to immerse the alloys, except in the case of the 10 magnesium-90 copper and 10 magnesium-90 nickel alloys. The more reactive alloys may be placed in a light paper bag and dropped on the surface of the iron, or poured on the melt with

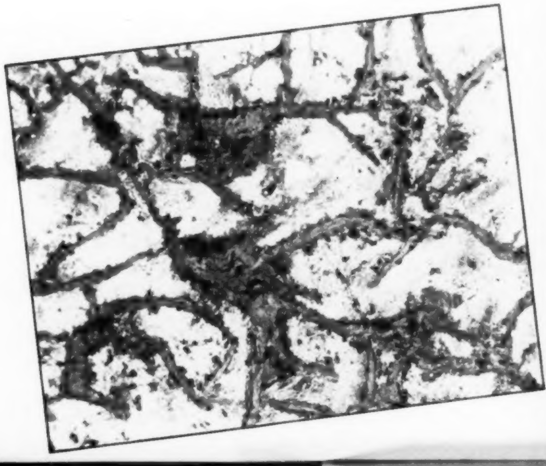


Fig. 6—Coarse graphite structure resulting from 80-20 Sb-Mg addition. Alloying efficiency is low—0.012% Mg.

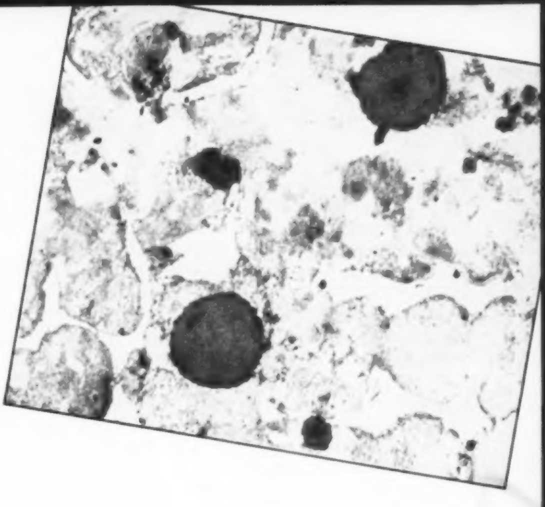


Fig. 10—Nodular effect produced by magnesium addition in a hypoeutectic iron (C. E. 2.9). Mg—0.073%.

a long-handled scoop. The slag should be carefully removed from the surface of the iron before the magnesium addition is made, since a coating over the melt surface will prevent the alloying of the magnesium.

A light-gage steel cover placed over the ladle immediately after the magnesium addition will tend to confine the flash and probably improve the alloying efficiency in the case of the more reactive alloys. For dependable results a late silicon addition of about 0.4 per cent should be made. This addition may be in the form of iron-silicon, calcium-silicon, or exothermic ferrosilicon.

Duration of the magnesium treatment effect is relatively short. With constant-temperature holding of about 50 lb melts it has been found that the effect largely disappears in about 10 min. There is a gradual deterioration of the nodulizing effect rather than a sharp line of demarcation as between treated and untreated metal.

It is possible that with larger ladles and dropping temperatures such as would be encountered in actual practice, the effect would persist for a longer time. In remelting, it will be found that the magnesium burns out, and there is no carry-over of the nodulizing effect.

Addition Amounts Vary

As mentioned previously, the desired range of magnesium in the cast iron appears to be of the order of 0.03 to 0.10 per cent. The amount of magnesium alloy which it is necessary to add will vary with the alloy used and the iron to be treated. The treatment is effective on either hypo- or hypereutectic irons. Although most of the irons used in this work were hypereutectic, Fig. 10 illustrates the nodular effect in one of those having a carbon equivalent of 2.9

A typical general purpose iron having a base composition of 3.2 to 3.6 per cent total carbon, 1.8 to 2.5 per cent silicon, 0.3 to 0.4 per cent manganese, 0.05 per cent phosphorus, and 0.03-0.04 per cent sulphur lends itself to the nodulizing treatment. However, it does not always occur that such a composition is used and variations sometimes affect the magnesium treatment and its efficiency.

If the sulphur content of the cast iron is not initially low, a portion of the magnesium will be used to reduce the sulphur to a low level, e.g., 0.03-0.04 per cent. It has been found that if the sulphur content is initially high, a higher manganese content such as 0.8 per cent will serve to reduce the necessary addition of magnesium.

If one desires to produce an iron with an appreciable as-cast elongation, the manganese should be held to 0.3-0.4 per cent and the phosphorus in the range of 0.05 per cent. Nodular graphite can, however be produced in alloys having manganese as high as 1.4 per cent and phosphorus contents as high as 0.60 per cent. Although manganese and phosphorus do not interfere with the production of nodular graphite, they do affect elongation. In the case of phosphorus, both toughness and ductility are markedly decreased, especially with amounts greater than 0.2 per cent.

Elements Preventing Nodularizing Effect

Thus far we have discussed primarily those factors which generally promote the nodular effect. However, some elements have been found to interfere with or poison the magnesium treatment. Titanium and zirconium, in mechanical mixtures with magnesium, have been found to prevent the nodulizing effect.

Fig. 7—Structure of cast iron treated with 55 Mg—45 Al addition. Mg—0.18 per cent.

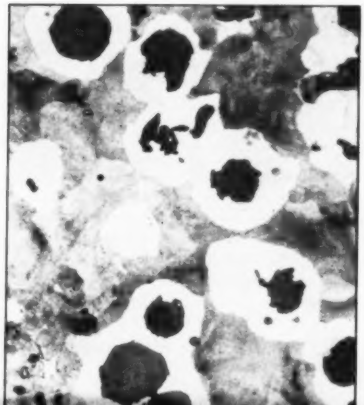


Fig. 8—Cast iron structure obtained with 90 Mg—10 Li addition. Mg—0.047 per cent.

Fig. 9—Mg 50-Bi 50 addition does not readily produce nodular iron. Mg—0.04 per cent.

Calcium-silicide, added before the magnesium, completely prevented the formation of spherulitic graphite. This is illustrated in Fig. 11.

That calcium-silicide may be successfully used as the late silicon addition is illustrated in Fig. 12. The use of carbon as a late inoculant after the magnesium, in place of silicon, has been found to be unsatisfactory. The simultaneous addition of ferrosilicon and the magnesium alloy is not recommended for best results. Likewise, the addition of exothermic ferrosilicon simultaneously with magnesium is not to be recommended. However, Fig. 13 shows that the late silicon addition may be in the form of exothermic ferrosilicon.

If desired, ferrosilicon may be added before the magnesium alloy so long as a late addition is also made. The effect of adding just any material as long as it contains magnesium may be seen in Fig. 14. Here it is shown that in spite of a high magnesium content the graphite structure is definitely not spherulitic. The magnesium alloy added to this melt contained 18 per cent magnesium, 36 per cent aluminum, 29 per cent copper, 6.5 per cent iron, 2.5 per cent lead, 4.0 per cent tin, and 4 per cent zinc.

Fluxes Investigated

The use of flux mixtures with the magnesium alloys has been briefly investigated and has interesting possibilities. Present magnesium fluxes, however, are not designed for high temperature applications such as are encountered in the melting of cast iron and will volatilize excessively. Nevertheless, they do appear to increase the alloying efficiency when mixed with the magnesium alloy. Further research is going forward with the view of developing satisfactory fluxes to reduce burning of the magnesium.

Addition of exothermic carbon to the cast iron before the magnesium addition does not appear to be detrimental, as may be seen in Fig. 15. As stated previously, however, carbon additions after the magnesium additions are not recommended.

As is well known, normal cast iron contains graphite in the form of flakes which form discontinuities and notches in the matrix and give relatively low strengths and brittleness. By converting these flakes to nodules or spherulites one is more nearly able to achieve the properties of the matrix material. One theory about the mechanism of this phenomenon is that it is a nucleating action and a building up of the nodule takes place by plating of the graphite on the nucleus. To our knowledge, positive identification of the nucleus has not been made.

Nodular graphite production can be achieved in all common cast iron compositions. The development of tensile strengths of 80,000 to 100,000 psi in the as-cast condition along with some ductility is not unusual. Of interest, also, is the fact that section size has much less effect on nodular iron than on ordinary gray iron.

An anneal such as one hour at 1650 F will give elongation of 20 per cent, while still retaining tensile strengths of about 70,000 psi. More complicated heat treatments, such as a one-hour normalize at 1650 F, followed by a 5-hr temper at 900 F, have been reported to have given tensile strengths as high as 165,000 psi, with yield strengths of 75,000 psi and 0.5 per cent elongation.

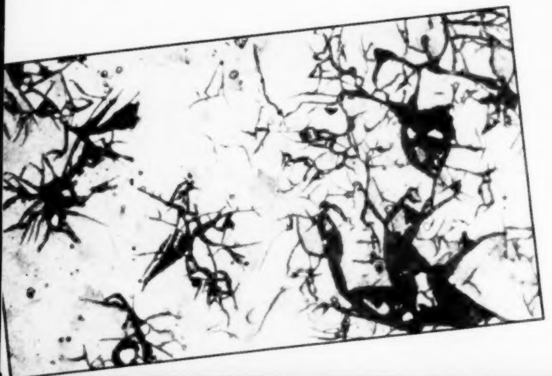
With a still different heat treatment (one-hour normalize at 1650 F followed by a temper at 1100 F) yield strengths as high as 115,000 psi are possible, with tensile strengths of 127,000 psi and 2 per cent elongation. If high as-cast elongations are desired (5-10 per cent) the manganese should be controlled at about 0.3 per cent, the phosphorus at 0.05 per cent maximum, and the silicon should be below 3 per cent.

Another interesting property of nodular cast iron is the modulus of elasticity of about 25,000,000 psi. This value is considerably in excess of that found in ordinary gray irons where the modulus of elasticity is quite variable, being of the order of 20,000,000 psi for low-carbon high-strength iron to 12,000,000 psi in high-carbon iron.

It is possible to tell from the fracture when graphite has been changed from the usual flake form to the nodular type. Whereas gray iron has a dull, dark colored fracture, the nodular iron has a fracture which appears to be white.

With a proper magnesium treatment, machinability of nodular cast iron is good. Excess magnesium will give increased hardness with, of course, increased machining difficulty. However, cut surfaces tend to be smoother with less tearing than gray iron develops.

Usual arc-welding techniques developed for cast



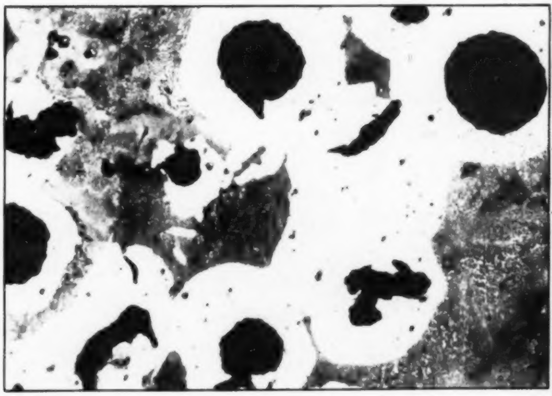


Fig. 11 (left)—Calcium silicide, added prior to the magnesium addition, completely prevented formation of spherulitic graphite. Mg—0.056 per cent. Fig. 12 (above)—Calcium silicide may be used as the late silicon addition after the magnesium treatment. Mg—0.057%.

Fig. 13—Structure obtained with late silicon addition as exothermic FeSi after magnesium treatment. Mg—0.025 per cent.

Fig. 14—Cast iron treated with 18% Mg, 36% Al, 28% Cu, 6.5% Fe, 2.5% Pb, 4% Sn, 4% Zn alloy. Mg—0.18 per cent.

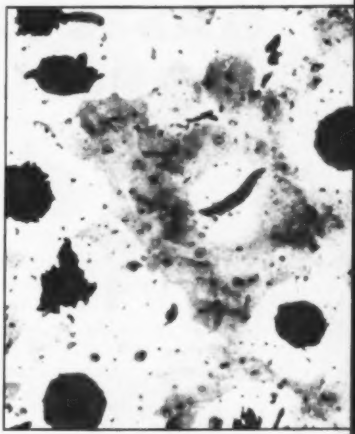


Fig. 15—Exothermic carbon added prior to Mg addition. Late silicon (FeSi) addition. Mg—0.07 per cent.

iron are applicable to the nodular cast irons. In welding with a nickel rod there appears to be a narrow zone of increased hardness along the edge of the weld zone, but there is no reversion to flake graphite. Spheroidal graphite has even been noted floating in the zone of fusion.

The casting qualities of nodular cast irons appear to be good. There appears to be no decrease in fluidity, but shrinkage of the treated iron is somewhat greater than in gray iron; therefore, heavier risers may be required.

Treatment of cast iron with magnesium to produce nodular graphite is so new that numerous questions remain to be answered. Of particular interest are ways of efficiently adding magnesium without the necessity of using high alloying constituents, property variations to be obtained by heat treatments, and foundry control methods to insure consistently uniform results. It is hoped that by cooperative effort the questions will soon be answered and that nodular cast irons will successfully take their place among the well-recognized gray irons, malleable irons and cast steel.

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Alloy Casting Institute Elects New Officers, Directors At Convention

Election of officers and a series of technical and business meetings were features of the Annual Meeting of the Alloy Casting Institute, held during July in Colorado Springs, Colo.

Elected president of the Institute for 1949-50 was Harry A. Cooper, president of the Cooper Alloy Foundry Co., Hillside, N. J. Other officers elected were: R. W. deWeese, Electric Steel Foundry Co., Portland, Ore., vice-president; and E. A. Schoefer, Alloy Casting Institute, secretary-treasurer. B. J. Gross, president, The Key Co., St. Louis; and M. G. Moore, Jr., president, Empire Steel Castings, Inc., Reading, Pa., were elected to serve on the Board of Directors for three-year terms.

Featured at the business and technical meetings were reports on the progress of the Alloy Casting Institute's metallurgical research program, which has been conducted during the past year at Battelle Memorial Institute, Columbus, Ohio, and Ohio State University, on corrosion at high temperature and high pressure, and corrosion by molten heat treating salts.

Robertson Founds Annual Award For The British Institute of Metals

A medal and premium, to be awarded to the author or authors of the paper adjudged to be of the highest merit contributed to the *Journal of the Institute of Metals* on engineering aspects of non-ferrous metallurgy each year, has been offered by W. H. A. Robertson & Co., Ltd., Bedford, England, and accepted by the Institute of Metals, London.

For the first award, a committee will consider papers published in the Institute's *Journal* from March, 1948, to August, 1949, inclusive. Thereafter the award will be made annually for a paper which has been published in the *Journal* during the period from September to August, inclusive, and which is judged to be the highest contribution to non-ferrous metallurgy.

WASTE CONTROL REDUCES COSTS

John R. Walley
Dayton, Ohio

Cost reduction is more than one man's job. Every person in the foundry must have a part in it. Top management must stimulate and encourage cost reduction by providing contests and training programs. Supervisors must locate waste and reduce costs by effective application of their training. Employees must have an opportunity in cost reduction contests, and be given an understanding of cost in relationship to competition, selling prices, and job security.

Waste control—the recognition and elimination of wasted time, effort, space, materials, and power—is a sound basis on which a foundry-wide cost reduction program may be initiated. Waste control training, as outlined in this paper, is simple in application, and effective in cost reduction.

Supervisors can learn waste control principles in three 1-hr meetings. At the first meeting the instructor should present a well-known foundry problem and guide the group in applying waste control principles. In this manner the group curiously participates in solving an interesting problem, meanwhile learning a method of recognizing and eliminating waste.

Operation Breakdown

A simple form is necessary for waste control (Fig. 1). In filling out this form a job is selected for analysis. Then the work is broken down into approximately ten small steps, which are entered on the form. The breakdown of an operation for waste control is comparatively simple when a small operation is selected. Experience shows that selection and breakdown of an operation is the major stumbling block encountered by the average person participating in a cost reduction program. The instructor should explain that major savings result from constant alertness to small sources of waste.

Applications of waste control principles should be requested on a volunteer basis for presentation when the group meets again. There is no better way to learn to reduce costs than by actually working on a problem in a systematic manner. It should be explained that, before the next session, the instructor will be glad to work with each volunteer on his problem.

A summary of waste control analysis principles should be outlined before closing the first session. Each participant should be given a copy of the summary. Figure 2 shows a summary which was used in a cost reduction program involving 50 supervisors.

The second meeting on waste control for cost reduction should emphasize questioning of each work step in an operation. The questions asked in each step are: What causes wasted time—effort—space—materials—power? When a cause of waste is found, it is written in the space allotted on the form. After asking these five questions for each step, the supervisor is in possession of a list of sources of waste on that particular operation.

Volunteer supervisors should apply waste control to operations in their own departments. Molding foremen can eliminate material wastes resulting from broken cores, and excessive use of chills, nails, and facing. Cleaning room supervisors can eliminate wasted time and effort resulting from ineffective material handling equipment. Coreroom supervisors can revise layouts and eliminate wasted space.

Supervisors need help in initially applying waste control principles, and the best way to determine the help needed is by having volunteers work out solutions to their own problems. During the third meeting the instructor should stress the necessity of working out a procedure to eliminate waste. Locating waste without removing it defeats the purpose of cost reduction activities.

When using the waste analysis form (Fig. 1) to develop a way to eliminate waste, the supervisor asks the question, "Why is the source of waste necessary?" This question is asked for each note made by the supervisor under the headings of time, effort, space, materials,

WASTE CONTROL

DEPARTMENT ________ ITEM ________ DATE ________

JOB BREAKDOWN

1.	6.
2.	7.
3.	8.
4.	9.
5.	10.

	TIME	EFFORT	SPACE	MATERIAL	POWER
WHAT CAUSES WASTE ?					
WHY IS IT DONE ?					
HOW CAN WASTE BE ELIMINATED ?					

Fig. 1—Waste control form used for job breakdown.

and power. Obvious waste, which can be eliminated immediately, offers no problem. The supervisor merely takes appropriate action.

Sources of waste which cannot be eliminated immediately require a planned program to effect correction. When the supervisor must plan step-by-step procedure, the space shown on the form, opposite the question "How can we eliminate waste?" is filled in with notes and plans. Individual initiative, ingenuity, and imagination determines what can be accomplished.

All detailed information about any one operation can be listed on the analysis sheet. It can be filed for later reference after the changes have been effected. This information is particularly valuable to the time study department as a basis for operation restudy.

Cost reduction requires more than a "shot in the arm." It must be a continuous program. Therefore, after three instruction sessions it is timely that a con-

Figure 2
Summary — Waste Control Analysis Principles

1. **Spot a Source of Waste**
   Any operation being done in your department is a source of waste until you have questioned it.
2. **Write Out the Work Done**
   Consider the main steps required to complete an operation. Try to list six or more steps.
3. **Ask Questions About the Work**
   Determine what causes wasted time, effort, space, materials, and power. Find out why it is done. Eliminate the source. If you can not find waste, change your write-up of the operation and question it again.
4. **Write Down Your Ideas**
   Assume every idea is sound, until it is rejected. Do not take action until you are sure that the idea is sound.
5. **Get Your Idea Approved**
   Talk it over with others. Know all the angles to it. Do not overlook a minor point which may result in the idea being rejected.
6. **Put the Idea Into Effect**
   A good idea, worked out but not put into effect, is also wasted time and effort.

Figure 3
Supervisor Conference

Topic
Continuing waste control.

Definition
Continuing waste control means to regularly locate and eliminate causes of wasted time, effort, space, materials and power.

Objectives
1. To determine what steps a supervisor can take toward continuing waste control in his department.
2. To determine what help supervisors need from top management in controlling wasted time, effort, space, materials and power continuously.
3. To determine how a supervisor can gain cooperation from his employees in controlling waste.

Discussion Questions
1. What should each supervisor do to control waste in his department?
2. What help from top management do supervisors need to continue waste control?
3. How can a supervisor obtain cooperation from his employees in controlling waste?

ference be held, with all supervisors attending. The topic should be "Continuing Waste Control." An outline for this conference is shown in Fig. 3.

The conference on continuing waste control will drive home the fact that cost reduction requires the wholehearted interest and cooperation of every individual in the plant. It will also stimulate thinking of aspects of cost reduction that are normally overlooked. Further, a definite program, made up of the best ideas from this group, can easily be put into effect. The supervisors will go along with the program enthusiastically because they have had a part in its planning.

No attempt has been made in this paper to develop training material for a program on organized cost reduction through waste control. Most men who want to conduct such programs, like to use their own ideas, illustrations, and facts to obtain an understanding of the objectives of their plans. However, the waste control analysis form, summary, and outline of the conference can be readily adapted for use with any group of foundry supervisors.

Cost reduction through waste control is the most effective tool within a supervisor's grasp. He can plan his own program, and then take action. Most cost reduction savings are small and concern wasted time, effort, space, materials, and power. If each supervisor accepts his responsibility for eliminating waste, cost reductions to meet competition will be accomplished, employees will have job security, and foundry men will enjoy that personal feeling of satisfaction resulting from knowledge of a job well-done.

World's Largest Grinding Wheel Factory Dedicated at Worcester, Mass.

This new plant of the Norton Co. at Worcester, Mass., costing more than $4 million, was dedicated recently. Over 602 ft. long and 320 ft. wide, the building contains approximately five acres of space for the manufacture of grinding wheels—the largest in the world. The building is constructed to house a radically improved process of grinding wheel manufacture, which enables wheels to be made to standards previously considered impossible in the manufacture of vitrified products. Left: a corner of the plant showing production lines for finishing operations on mounted points and wheels. Right: airplane view showing new grinding wheel plant in left foreground.

OXYGEN INJECTION PROCESS IN MELTING LOW CARBON CR-NI STAINLESS STEEL

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THE TREMENDOUS IMPETUS given developments concerned with the use of oxygen in the melting of low-carbon chromium-nickel stainless steel in direct-arc, acid-lined furnaces is easily explained when we consider the obvious disadvantages of the current method which utilizes iron ore for decarburization purposes. These disadvantages may be summarized as follows:

1. Large chromium loss during the boil.
2. Severe limitations on the amount of 18-8 scrap which can be economically employed.
3. Increased melting time necessitated by ore boil.
4. The net bath reactions are endothermic, thus lowering the bath temperature.
5. Use of iron ore accelerates attack on acid furnace linings.

Before the development of oxygen injection technics, The Cooper Alloy Foundry Co. regularly employed flat melting in direct-arc furnaces. Although we were aware that the use of induction furnaces for melting eliminates the problem of carbon pickup inherent in the direct-arc process, the induction-melting capacity at our plant was insufficient to meet the large demand for stainless castings of the 18-8 type. To insure that the heat would meet the 0.07 per cent carbon maximum often specified for cast 18-8, it was necessary to "go into the furnace" at $<$0.05 per cent to compensate for the normal 2-point pickup from electrodes.

Material Types Used

A large amount of virgin material was therefore used, the exact amount varying with the carbon content of the available scrap. Typical charges and their costs based on current prices are shown in Table 1. All 18-8 scrap, both heads and gates as well as purchased scrap, are listed at the present market value, while new materials are shown at their present prices.

Previous research* had demonstrated that the equilibrium of the carbon-chromium oxidation favors the retention of chromium in the bath at high temperatures. Since direct oxidation results in net exothermic reactions, the bath temperature is raised and more chromium can be retained in the melt at a given carbon content than can be retained with an ore boil. This allows a much greater amount of 18-8 scrap to be utilized in the charge.

On the basis of this and other research data, and considering the inherent disadvantages of the process being employed, it was decided to experiment with oxygen injection. We were fortunate in having at our disposal a 30,000 cu ft cascade storage unit which had been installed to expedite burning off heads and gates.

Since preliminary investigation had shown the practical uselessness of employing small oxygen bottles, a 200-ft length of 1¼ in. extra heavy pipe was connected to this storage unit and laid out to extend into the furnace area. The furnaces to be used for the melting were two acid-lined direct-arc units of 1000- and 500-lb nominal capacity, respectively. These furnaces are generally charged at 150 per cent of the rating, and the melting cycle is roughly one hour for this charge.

The first work was done in the 500-lb furnace. Several heats were run under different conditions of bath temperature and melt carbon. The results are shown in Fig. 1.

An interpretation of these results in the light of previous research done by D. C. Hilty is valuable toward an understanding of the various factors involved. These factors are:

1. Initial bath temperature.
2. Initial carbon content.
3. Initial chromium content.
4. Volume of oxygen injected.

TABLE I

18-8 FLAT MELTING HEAT SHEET — ARC MELTING

ALLOY	SCRAP	WEIGHT	¢/#	TOTAL COST	$/TON
18-8	Scrap (Heads & Gates)	467	5.0	$ 23.40	
	Nickel	43	42.6	18.30	
	Fe Cr .06%	185	21.0	38.80	
	Armco	305	5.0	15.25	
				$ 95.75	$191.50
18-8	Scrap (Heads & Gates)	370		$ 18.50	
	Nickel	55		23.40	
	Fe Cr	215		45.20	
	Armco	360		18.00	
				$105.10	$210.20

18-8 OXYGEN MELTING - ARC MELTING

ALLOY	SCRAP	WEIGHT	¢/#	TOTAL COST	$/TON
18-8	Scrap (Heads & Gates)	890	5.0	$ 44.50	
	Nickel New	10	42.6	4.26	
	Fe Cr .06%	100	21.0	21.00	
				$ 69.76	$139.52
18-8	Scrap (Heads & Gates)	727	5.0	$ 36.40	
18-8	Turnings	149	1.5	2.24	
	Nickel	10	42.6	4.26	
	Fe Cr .06%	114	21.0	24.00	
				$ 66.90	$133.80

* D. C. Hilty, Relation Between Chromium and Carbon in the Refining of Chromium Steel, AIME *Preprint*, Electric Furnace Steel Conference, Dec. 2-4, 1948.

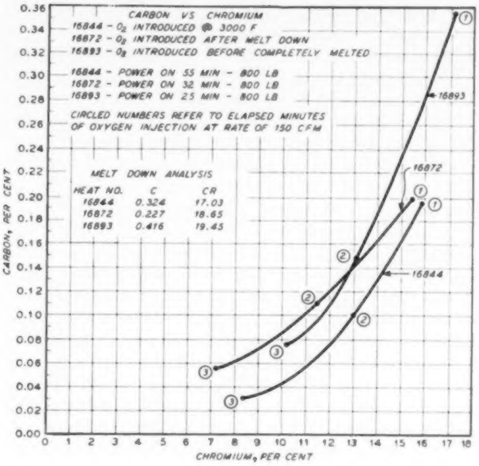

Fig. 1—Carbon-chromium relationship during oxygen injection of heats in acid-lined direct-arc furnaces.

Variation of these factors influences the following results:

1. Final carbon content.
2. Final chromium content and the chromium loss.
3. Final bath temperature.
4. Over-all melting time.

The bath samples used to construct these curves were taken from the furnace by means of a slag-coated steel spoon at the times indicated *while* the injection was taking place. All specimens were analyzed chemically. The rate of oxygen flow was held constant by fixing the variables of pipe size, pipe length, and the injection pressure. The bulk oxygen supplier furnished a chart showing the relationship between these variables and the rate of gas flow. The pressure was held at 60 psi through a 10-ft length of ½-in. pipe, resulting in a flow of about 150 cfm (Fig. 2).

As can be seen in Fig. 1, the best results were obtained in heat No. 16844 where injection was begun at a temperature of about 3000 F. The rate of carbon elimination relative to the rate of chromium oxidation in heat No. 16872 was much slower and the bath contained 8.5 per cent Cr at a carbon content of 0.065 per cent, while in No. 16844 the carbon was reduced to 0.031 per cent for the same chromium content. Electric power was utilized for 55 min in heat No. 16844, while heat No. 16872 required power for only 32 min.

Oxygen injection was begun before the bath was completely melted in heat No. 16893. The results show that although 3 min of injection brought the carbon down to only 0.075 per cent, the curve crossed that of No. 16872. From the data in D. C. Hilty's paper, this would indicate that the final bath temperature is high. Production heats corroborate this. In spite of the high bath temperatures, no unusual refractory wear has occurred. Undoubtedly, this is due to the practice of rapidly adding the calculated amount of cold ferrochromium after the blow.

These results show that although considerable furnace time can be saved by injecting oxygen during or immediately after melt down, the chromium loss is greater than that which occurs if injection is delayed until much later in the heat. It was decided that operations should be set up so as to minimize the chromium loss.

Most production heats are calculated to melt down between 0.12 and 0.20 per cent carbon. The entire heat is charged into the furnace initially with the exception of the ferrochromium. The heat is melted down and brought to a temperature range in the vicinity of 3050 F as judged visually on the melter's spoon. This melting is accomplished with the use of as little slag as possible.

Injection Rates and Additions

The injection flow rate is held at approximately 150 cfm as previously noted, and injection is halted when the observer notes a sharp drop in the luminous carbon flame. For a 1500-lb heat, this generally results in a 2¼-min injection, and the heat finishes between 0.06 and 0.075 per cent carbon. The ferrochromium is then rapidly shoveled into the bath. Complete solution of the ferrochromium is easily obtained since the bath temperature after injection is roughly 3300 F. After stirring the slag to free any entrapped ferrochromium, the heat is tapped and the silicon and manganese added in the ladle. Tapping temperatures are generally in the neighborhood of 3100 F.

The amount of ferrochromium to be added is based on the assumption that the chromium content of the bath after the blow will be 12 per cent. A certain percentage of extra ferrochromium is added above that required to bring the chromium content to 18 per cent to provide a certain amount of safety from the danger of over-oxidation, or an error in the materials charged.

Everyday use of oxygen melting was begun on January 3rd of this year. Within two weeks, all 18-8 scrap of known composition had been treated with oxygen. Following this, purchased 18-8 scrap was blended with heads and gates of known composition and utilized by oxygen melting. A large part of this scrap consisted of petroleum-coke-incrusted 18-8 oil refinery pipe which previously could not be used because of the prohibitively high carbon pickup from the coke.

Considerable amounts of 18-8 turnings are available

Fig. 2—Examining oxygen lance prior to demonstration of oxygen injection technics in melting 18-8 steel.

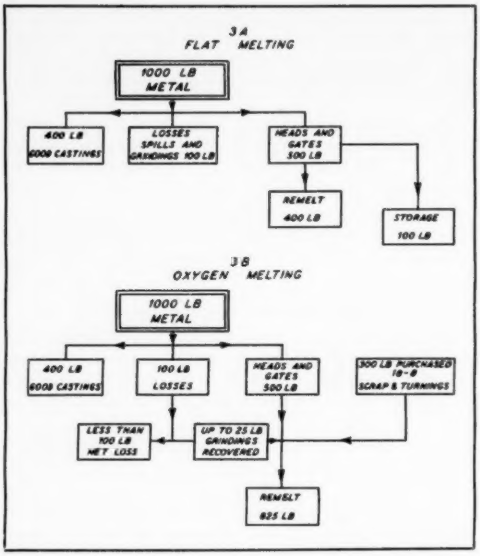

Fig. 3—Materials balance comparison—flat melting and oxygen injection method. Based on 40 per cent yield.

as a waste product of the machining of stainless steel fittings and valves, and these turnings are utilized to maximum advantage in the oxygen melting practice. The introduction of up to 30 per cent of the charge weight in the form of these oily turnings immediately raises the carbon content to a high and variable value.

Tests on production heats show that the range is from 0.30 to 0.60 per cent carbon. The melting practice is the same as that already described, and the oxygen injection is again continued until the carbon flame drops. In such cases, the injection time may run as high as 3½ min. At the present time, several thousand pounds of 18-8 turnings are being used weekly instead of being sold at the low market price for turnings.

Further economies were realized through an investigation of the possibility of recovering the alloy value in the refuse gathered weekly from the cleaning room dust collectors. A chemical analysis of this dust showed it to contain 9.5 per cent Cr, 10 per cent Ni and 1.86 per cent C. It is now standard practice to add 20 to 40 lb of these grindings to a 1500-lb heat.

It is of considerable interest to compare operations before and after the use of oxygen melting on the basis of a materials flow chart. This chart is set up on the assumption of an over-all yield of 40 per cent, which is a rough average of the yield obtained at the Cooper Alloy Foundry over a period of several years. The chart is shown in Fig. 3. Figure 3A depicts flat melting operations before the use of oxygen, and Fig. 3B shows the result of oxygen injection. These charts are set up on the basis of 1000 lb of metal charged.

It is quite evident from Fig. 3A that flat melting continually builds up the amount of scrap on inventory. With oxygen melting however, not only are all returned heads and gates remelted, but also high carbon 18-8 scrap and turnings can be used directly. Table 1 shows the effect of this higher percentage remelt upon the basic cost of metal charged. Heats 1 and 2 show the extremes of flat melting practice, while heat 3 is typical of present oxygen practice.

A comparison of these cost figures indicates that the use of oxygen melting will enable the basic metal cost of 18-8 as charged to be reduced roughly by $60.00 per ton. Continued savings of this kind would, of course depend on having a large supply of 18-8 scrap.

In the initial month of operation, Jan. 1949, the number of oxygen melted heats totaled 112. In subsequent months, the number has dropped to between 70-80. This drop is actually a consequence of the use of oxygen. As soon as the majority of the known scrap had been subjected to oxygen treatment, immediate use of this treated scrap was made in the 2000-lb capacity induction furnace. The charge consisted almost entirely of heads and gates of a carbon content of 0.07 per cent maximum.

Thus, it can be seen that the use of oxygen in arc melting does not render the induction furnace obsolete for the melting of low carbon 18-8. Actually, the two processes complement each other economically. The oxygen-arc process reclaims low quality 18-8 scrap of unknown carbon content while the induction melting process subsequently remelts the reclaimed heads and gates with the close control of analysis inherent in this process.

Further investigations are being conducted and will be reported in future papers.

Powder Cut 100-Ton Cast Iron Bases

Powder cutting of cast iron machine bases, each of them weighing 100 tons, into five sections has been accomplished by the Illinois Equipment Co., Chicago, at an average time of one hour per base.

Using specially-designed, extra-heavy cutting equipment, Illinois Equipment reports that speeds as great as four inches per minute were attained during some portions of the cut, thickness being about 43 in.

SAFETY EDUCATION THROUGH VISUAL AIDS

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New York

MANY FOUNDRIES have approached the safety program in the shop from the standpoint of *preventive* rules and regulations, and of applying physical safeguards to properties, facilities and equipment. However, more and more stress is being laid upon *education* —getting the foundry worker into that attitude of mind which will cause him to habitually "play safe."

It is not difficult to see that progress has been made in this direction. Techniques and methods have been brought to greater efficiency. Studies have revealed weaknesses and proved strong points of safety education. Leadership has been raised in quality and, along with these improvements, greater use is being made of educational films, particularly basic films which are the result of broad studies.

Another development is the tendency for employers to extend the safety education program beyond the foundry into the homes of workers, and on nearby streets and highways. Films are useful here also. Employers feel today that every trained worker is an asset, and that poor safety habits outside the plant are just as costly to the shop as accidents on the job.

Let us survey briefly the present-day field in which visual aids are being integrated with safety education programs in the workrooms and on work properties, as well as in the community and homes. Numerous motion pictures and slide films dealing with all phases of safety care are available—safety in the home, in the factory, in travel, on the highway, and at the machine. These films fall into several groups insofar as the safety education student is concerned.

Integrating "Aid" and Program

Motion Pictures: Films are designed to bring experiences to the individual's attention, analyze safety functions, appeal to the emotions, and portray dangerous situations.

Slide Films: A series of still pictures on 35 mm safety motion picture film is available. Two types, silent discussional and sound with accompanying disc record are widely used in safety work. They are used where it is not essential to show motion, and present clearly a series of ideas without action. Discussional slide films are best for teaching "how-it-works" and "how-to-work-it-safely" jobs and skills. In the case of the sound slide film, the record can carry the commentary, thus making it unnecessary to have a speaker in person before each group.

Slides: Films of the various types are not the only "visuals" available. Miniatures, glass slides, models, and "mockups" have been widely used for teaching many phases of safety education. Such visuals do very well for small groups of employees, or for individual study. They provide a realism which the film approaches but does not equal. Also used are still pictures, projections, reliefs, and an endless variety of devices and methods of showing where danger waits.

Integration of the various types of "visuals" with established or newly planned safety education programs depends on the particular problem in a given shop or plant and the nature of the correlated safety education program.

Safety slide films, with or without sound, are shown in *connection* with talks, round table discussions, and foremen's schools. They may furnish the basic material for discussion or meetings, or may simply amplify and accentuate basic principles in particular local shop practices.

Slide films are also used as "refresher" material. At regular intervals foremen or supervisors are given a repeat showing of the films with accompanying discussions and reading material. The films are also used to indoctrinate newcomers with the safety principles which prevail in the plant.

Make the Worker Aware of Hazards

Motion pictures tend to put the worker into a receptive frame of mind regarding the whole subject of safety and protection from accidents. They tend to make him constantly aware of such hazards through habit. This is the primary function of the safety motion picture.

In other words, the motion picture is designed to awaken the worker and to inculcate the safety habit. Other media and methods are intended to show the "what" and "how." Some programs, especially in large organizations, are designed merely to train foremen and supervisors, letting the education trickle down to the individual worker through supervision.

The program of a typical safety meeting in which a sound slide film is integrated may be as follows:

1. Introduction of subject.
2. Projection of film with record.
3. General discussion of main points made.
4. Projection of film only (no record) and pause for discussion of high points.
5. Quiz period. Questions bearing upon the material asked and answered at random to test attention and memory.
6. Substance of information on the films passed around in printed form for restudy at leisure.

In the case of sound movies, such meetings usually lead off the entire safety education program. They set the pace—show why the program is being projected and stress its importance to the individual employee. The employer interested in stepping up his safety education program with visual aids may have films produced to suit his particular needs, or may utilize films already available that deal with basic and approved principles of safety.

As previously mentioned, it is becoming common practice for employers to carry safety education into the home of the worker and into his street or traffic experiences. Employers are working these outside factors into regular safety programs, and families are permitted to participate in this phase of the work.

Few users of visual aids in safety education contend that films alone will provide a complete program. But, they can be successfully correlated with posters, dodgers, exhibits, talks and speeches. They must be used properly to be fully effective.

MODERN FOUNDRY METHODS...

Until recently the 22 large cupolas in the Rouge Plant production foundry of the Ford Motor Co. were lighted in the usual manner. Four carloads of scrap wood per week and much time and labor were required—the method was both inconvenient and expensive.

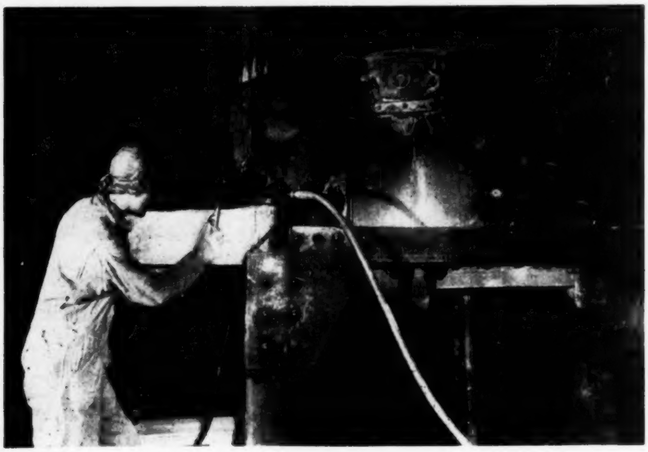
The plant cupolas are being equipped with coke igniters, which do a much more economical and satisfactory job. The coke lighter, which is operated by compressed air and electricity, looks like an over-sized gun. The 38-in. barrel is inserted through an opening in the base of the furnace, where it comes in contact with a bed of small coke. An electrode is pushed through an insulated tube in the barrel.

With 250 to 300 amperes and 40 volts applied, an electric arc leaps through the coke and returns to the barrel. Coke contacted by the arc is ignited in one or two minutes. A jet of compressed air sent through the barrel speeds the burning process.

The electrode is removed within a few minutes, but the air is left on for about 20 min. until the regular furnace blower is turned on. Within another 20 to 25 min. the coke bed is thoroughly "burned in." The furnace then is charged in the usual manner. About 8 min. after charging molten iron begins to trickle down through the coke, and in 22 min. the furnace is ready for tapping.

The new cupola lighting procedure, as described by F. C. Riecks, foundry operations manager, is as follows: A piece of light-gage scrap steel (left) is laid across the bottom, and covered with 2 in. of coke breeze. The gun is inserted (above) and covered with an 8-in. layer of coke breeze which is continued in a narrow path across the cupola. When two igniters are used, one path intersects the other. Large coke is then charged to tuyere level.

Connect the ground wire of the source of power (welding machine or transformer) to the ground connection on the gun. Connect the air line (80-lb. pressure), pull the gun back a few inches and turn on the blast valve for a few seconds to clear the end of the barrel (coke within the barrel may cause an arc and damage the gun).



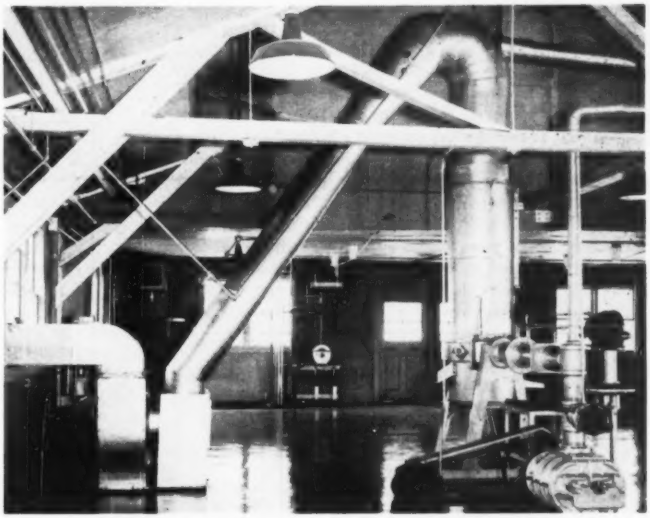
Place the ¼-in. coated welding rod in the end of the electrode holder and insert into the gun — then push forward until it touches the coke—draw back about 6 in. and connect the positive wire to the electrode.

Turn on air for vibrating electrode; turn on power and move inward (left) until it strikes an arc on the coke, then feed slowly to provide a continuous arc until the electrode holder comes to the stop position. Turn off the power, remove the vibrator assembly and insert the booster pipe to support rapid combustion.

The gun should be drawn back a few inches at a time to keep the tip away from the white-hot bed. The booster air helps to cool the gun.

When the whole bed is burning satisfactorily (15 to 20 min.), the gun can be removed.

...MODERN FOUNDRY METHODS



Control of cupola stack emissions at the University of Wisconsin foundry is accomplished with a 6,300-cfm exhaust fan and seven water sprays installed in the 16-in. I.D. downcomer.

Common garden hose nozzles are used for sprays, with copper gaskets in place of the usual rubber washers.

Part of the water is vaporized and leaves the system as steam in the gas, but most of it collects in the small box in front of the fan and drains into a sewer. The accumulated dust in the sump is removed periodically.

The installation has proved effective in controlling dust and no difficulty in operation has occurred.

Small units, such as castings and machined parts, are emptied from skid bins all at once, rather than one at a time, by use of a hinged, drop-bottom bin.

The skid bin has a large eye welded to the end to which the bottom is hinged. To engage the eye, a hook is secured to the top of the mast of the truck which handles the bin. Forks lift the skid-bin to where the chain-manipulated hook engages the bin-eye and suspends the bin. The operator then lowers the forks of the truck, allowing the bottom of the bin to hinge downward.

Construction of a small metal funnel and guide met the need for a rapid and accurate method of transferring samples of iron drillings from watch glass to combustion boat in carbon determinations in the laboratory of the Saginaw Malleable Iron Plant, Saginaw, Mich. Walter R. Renshaw, of the Saginaw plant, demonstrates the method.

The funnel is fabricated of 40-gage sheet metal in the shape of a truncated rectangular prism with bases $\frac{3}{4}$ x $2\frac{3}{8}$ in. and $\frac{1}{4}$ x $\frac{3}{4}$ in. Four legs of $\frac{1}{8}$-in. rod, secured to a base plate of 1/16-in. steel 3 x $5\frac{1}{2}$ in. in size, maintain its position above the guide.

The guide is formed from a 4-in. piece of 40-gage sheet metal, the center channel having the same depth and width as the combustion boat. It is permanently attached to the base by four rivets.

By use of the funnel the possibility of losing part of the sample is materially reduced, and the sample is placed in a relatively small area of the boat, allowing a single boat to be used for several determinations.

MOISTURE IN BENTONITE INFLUENCES STRENGTH

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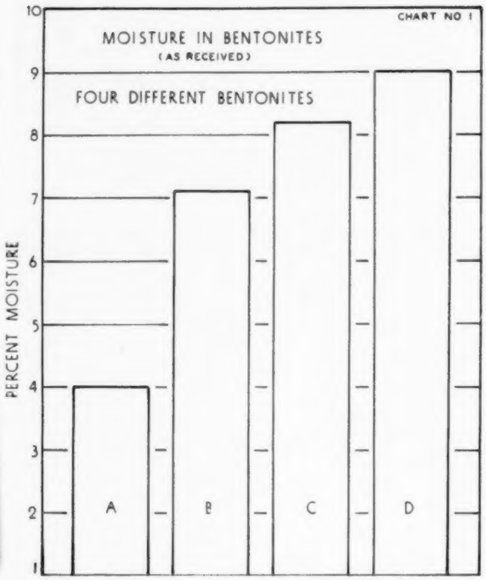
Carpenter Brothers, Inc.
Milwaukee

For foundry usage bentonite is generally purchased on a basis of the green compression strength that it will impart to the sand mix being used. Other tests, notably the green deformation, dry strength and wetting rate,* have been used, but the green compression strength test is still probably the most widely accepted for evaluating foundry bentonite.

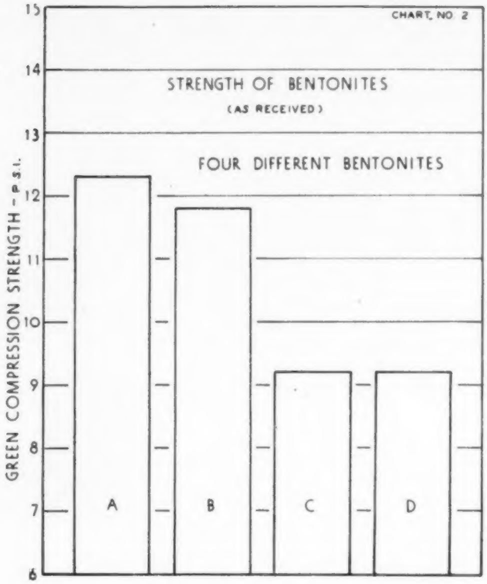
Consequently, the factors that affect this property of a bentonite-sand mix will be of interest to the foundryman. As a result of many tests run in the author's laboratory, it has been decided that one of the most crucial of these factors is the moisture content of the bentonite in the "as received" condition.



To investigate the effect of this moisture on the potential strength of the bentonite four samples were procured, each from a different supplier. The moisture content of each sample was determined by drying 50 grams for 4 hr at 230 F. Results of these moisture tests will be found on Chart 1. It will be seen that there was a total variation of about 5 per cent, which would amount to 100 lb of excess water per ton in the wettest of the four bentonites.

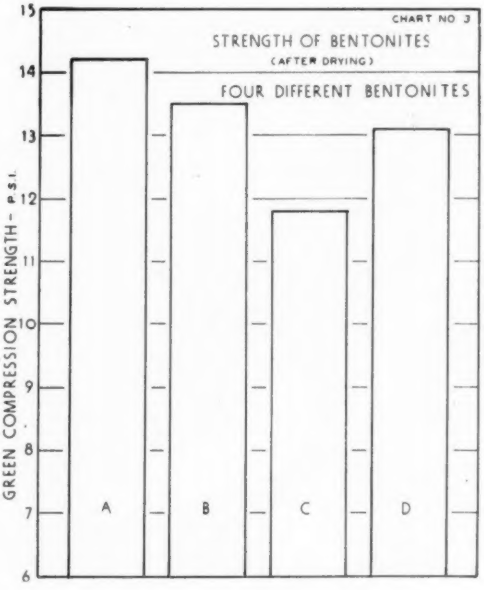
For the green strength determination the first series of tests was made using the bentonites with the "as received" moisture in the following mix: Muskegon lake sand, 96 per cent by weight (A.F.S. Grain Fineness—47); bentonite, 4 per cent by weight; moisture, 2 per cent of total; mulled 2 min dry and 3 min wet; tempered 2 hr.

*E. C. Troy, "Variable Properties Found in Western Bentonites," American Foundryman, May, 1948, p. 111.



Several green compression strength tests were made on each sample, using a standard A.F.S. 2-in. specimen. The tests for each of the four bentonite mixes were averaged and are shown graphically on Chart 2.

An examination of these data demonstrates that bentonite "A", which had the lowest moisture "as re-



ceived", also developed the highest green strength. The other samples developed strength approximately in inverse proportion to their moisture content.

For the final check on the effect of moisture, the four bentonite samples were dried at 230 F for 4 hr in a laboratory drying oven. These dried samples were then used in preparing bentonite-sand mixtures the same as for the first series of tests. The moisture content of these mixtures was also 2 per cent. The average green compression strength developed by each of these mixes, which were made with the dried and retempered bentonite, is shown graphically on Chart 3.

This chart shows that bentonite "A", which was the sample with the lowest "as received" moisture, still furnishes the most strength, after being dried for 4 hr at 230 F. Whereas the differences in green compression strength shown on Chart 2 may be attributed to the difference in moisture content, it is reasonable to assume that the strength differences illustrated on Chart 3 are due to basic differences in the four deposits from which the bentonites were shipped, or possibly due to different methods used in the manufacturing processes at the four plants.

Conclusions

1. Bentonites as shipped from the suppliers' plants do differ in moisture content.

2. Low moisture in bentonite is desirable because:
   (a)—more strength is developed per pound
   (b)—freight expense is reduced.

3. Variations in moisture content of different shipments of bentonite are apt to cause fluctuations in properties of foundry sand mixtures.

4. Bentonites, like other clays, show basic differences in potential strength even after the moisture variable has been eliminated.

It is not recommended that foundries request bentonite to be delivered with moisture below approximately 4 per cent since this would tend to create a dust problem which might affect the efficiency of the mulling operation, and the additional heat applied at the plant might adversely affect the properties of the bentonite. Rather, it is suggested that the request be made to hold the moisture content to a reasonable figure, such as 4 to 6 per cent.

International Group Studies Clay

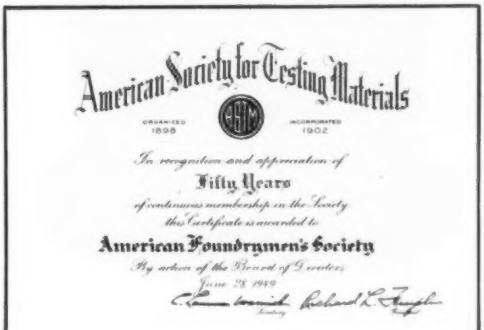
First activity of the International Committee for the Study of Clays (Comite International pour l'Etude des Argeles) concerns standardization of the differential thermal procedure. Formed in London in August, 1948, at the meeting of the International Geological Congress, CIPEA plans to assemble a complete documentation on the studies of clays and their means of study, to facilitate contacts between specialists in these studies, and to hold periodic meetings for discussion.

Chairman of the committee is S. Henin of France; M. Lepingle, Belgium, is secretary. Membership is limited to two representatives from each country. Ralph E. Grim, Illinois State Geological Survey and W. P. Kelley of the University of California are the United States members. The committee functions through an executive sub-committee consisting of Messrs. Henin, Lepingle, Grim, and D. M. C. MacEwan who represents Great Britain.

A.F.S. Honored As 50-Year Member At ASTM's 52nd Annual Convention

One of the first recipients of an award given in recognition of 50-year membership in the American Society for Testing Materials, the American Foundrymen's Society received a commemorative certificate at the 52nd Annual Meeting of ASTM, held in Atlantic City, N. J., the week of June 27. The award was made to A.F.S. and other 50-year members at a luncheon which also featured the president's address and the introduction of new ASTM officers.

Elected president of the Society, the first Canadian to be so honored, was J. G. Morrow, metallurgical engineer, Steel Company of Canada. Members in the metals field elected to the ASTM Board of Directors were: N. L. Mochel, manager of metallurgical engineering, Westinghouse Electric Corp.; F. E. Richart,



American Society for Testing Materials
Organized 1898 — Incorporated 1902
In recognition and appreciation of
Fifty Years
of continuous membership in the Society
this Certificate is awarded to
American Foundrymen's Society
By action of the Board of Directors
June 28 1949

Reproduction of the commemorative certificate awarded A.F.S. in recognition of its 50 years' membership in the American Society for Testing Materials.

research professor of Engineering Materials, University of Illinois; and Dean M. O. Withey of the College of Engineering, University of Wisconsin.

Featured technical address of the meeting was the 23rd Marburg Lecture, delivered by William M. Baldwin, Jr., research professor, Case Institute of Technology, on "*Residual Stresses in Metals.*"

Other meeting speakers and their subjects were: H. W. Gillet, Battelle Memorial Institute—"*Present Knowledge of Low-Carbon 18-8;*" W. O. Binder and C. M. Brown, Union Carbide & Carbon Research Laboratories, Inc.—"*Influence of Carbon and Molybdenum on the Intergranular Corrosion Resistance of Austenitic Chromium-Nickel Steels With and Without Columbium;*" and J. W. Freeman, E. E. Reynolds, D. N. Frey and A. E. White of the University of Michigan—"*The Influence of Conditions of Heat Treatment and Hot-Cold Work on the Properties of Low-Carbon N-155 Alloy at Room Temperature and 1200 F.*"

Other subjects discussed were ultrasonic testing, residual stresses in metals, radiography, spot testing analytical methods, and high temperature alloys.

GATING CONTROLS TEMPERATURE GRADIENTS IN STEEL CASTING

J. A. Shuffstall
Assistant Plant Manager
National Erie Corp.
Erie, Penn.

Fig. 1—Large steel cylinder casting weighing 45,000 lb designed for use on huge hydraulic presses.

PROPER GATING AND CUSTOMER COOPERATION resulted in sound steel castings needed for aircraft production in the early stages of World War II. Weighing 45,000 lb, the castings (Fig. 1) were cylinders for huge hydraulic presses.

Seven feet long and almost as large in diameter, the castings as originally designed (Fig. 2) would have been difficult to feed regardless of which end was up. Practical molding technique dictated that the casting be molded with the open end down—thus eliminating the hazards of suspending a large core from the cope—in a three-part flask. The core-box was constructed so that the core could be rammed on end and baked in the position it would occupy in the mold. This eliminated extra handling and rolling over.

To eliminate the possibility of centerline shrinkage or a larger shrinkage defect at the intersection of the bore and heavy flange of the casting, the customer's engineers agreed to streamline the sidewall as shown in Fig. 3. The new design had an essentially uniform wall thickness of about 8¼ in., eliminating the previous variations which ranged from 7¾ to 9½ in.

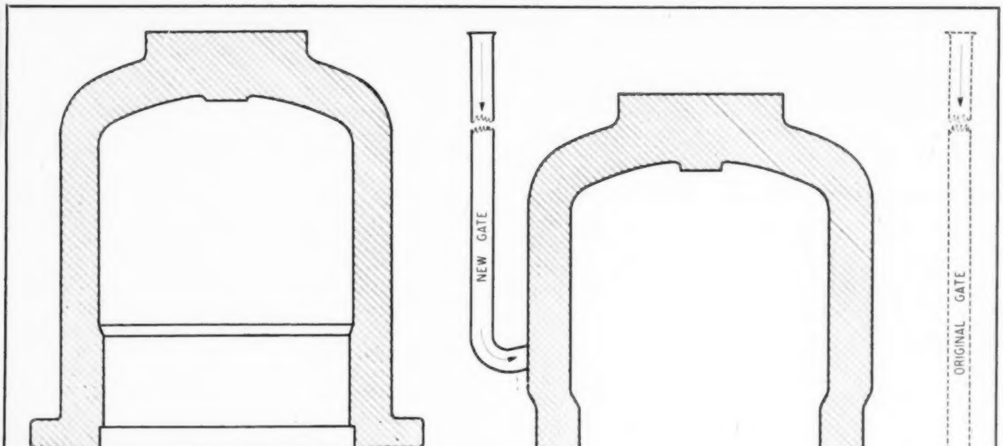


Fig. 2 (above)—Sketch showing cross section of steel cylinder as originally designed.

Fig. 3 (right)—Modified design of cylinder casting has uniform wall section thickness.

In making the first mold, two open risers were placed on the spherical end of the cylinder. Both 32 in. long, one was 36 in. in diameter, the other had a diameter of 27 in. An orthodox type of bottom gate was used, and two 4-in. diameter ingates were provided on the bottom of the flange as shown in Fig. 3.

The sand used for both mold and core was a coarse silica sand containing about 10 per cent natural bond, and obtained from either Northwestern Pennsylvania or Southern Ohio. The core and mold wash used was prepared in the foundry from silica flour. Mold and core were closely nailed, especially portions expected to be subject to severe washing and penetration. The mold was dried thoroughly. The core was bolted to the bottom plate of the drag, thus avoiding the need for chaplets.

After assembling and closing the mold, it was poured from a 35-ton open hearth furnace heat. The tapping

Fig. 4—Casting poured with bottom gate had crack on interior junction of sidewall and cylinder. The four rectangular burned and ground areas are surfaces where refractories were used in the mold for support.

temperature of this heat was approximately 2700 F. Pouring was delayed until the last possible moment in order to reduce the temperature. Preliminary inspection, after cooling in the flask and cleaning, revealed a crack on the interior of the cylinder at the junction of the bore and the side wall of the cylinder (Fig. 4). The crack was chipped out completely and found to penetrate approximately half the thickness of the wall and to extend nearly around the circumference of the cylinder.

The foundry staff reviewed the technique used and decided to make only a single change—instead of using the bottom gate a side gate was to enter the casting about 4 in. above the junction of the bore and the sidewall (Fig. 3).

Additional castings made with the modified practice were sound because there was sufficient change in the heat gradient to overcome the tendency to crack as the first casting did. Cutting action resulting from the cascade of metal from the sidegate was insignificant.

Future Meetings and Exhibits

INSTRUMENT SOCIETY OF AMERICA, 4th national instrument exhibit, St. Louis Municipal Auditorium, St. Louis—Sept. 12-16.

MAGNESIUM ASSOCIATION, quarterly meeting, Hotel Statler, Detroit—Sept. 15-16.

STEEL FOUNDERS' SOCIETY OF AMERICA, annual technical and operating conference, Statler Hotel, Cleveland—Sept. 15-17.

NATIONAL ASSOCIATION OF FOREMEN, 26th annual convention, Statler Hotel and Masonic Temple, Detroit—Sept. 21-24.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS, midyear meeting, Columbus, Ohio—Sept. 25-Oct. 1.

AMERICAN MINING CONGRESS, Spokane, Wash.—Sept. 26-28.

AMERICAN IRON & STEEL INSTITUTE, regional technical meeting, Hotel Statler, Buffalo, N. Y.—Sept. 29.

MAGNESIUM ASSOCIATION, midyear meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.—Sept. 29-Oct. 1.

STEEL FOUNDERS' SOCIETY OF AMERICA, fall meeting, Greenbrier Hotel, White Sulphur Springs, West Virginia—Oct. 3-4.

AMERICAN COKE & COAL CHEMICALS INSTITUTE, annual meeting, Skytop Lodge, Skytop, Pa.—Oct. 3-5.

ASSOCIATION OF IRON & STEEL ENGINEERS, annual convention, William Penn Hotel, Pittsburgh—Oct. 3-6.

AMERICAN IRON & STEEL INSTITUTE, regional technical meeting, Drake Hotel, Chicago—Oct. 6.

NEW ENGLAND REGIONAL FOUNDRY CONFERENCE, Massachusetts Institute of Technology, Cambridge, Mass., Oct. 7-8.

ASSOCIATION TECHNIQUE DE FONDERIE, 23rd annual congress, Paris, France—Oct. 10-11.

AMERICAN SOCIETY FOR TESTING MATERIALS, Pacific Coast Meeting, Fairmount Hotel, San Francisco—Oct. 10-14.

ELECTROCHEMICAL SOCIETY, 96th convention, La Salle Hotel, Chicago—Oct. 12-15.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION, annual meeting, The Greenbrier, White Sulphur Springs, West Virginia—Oct. 13-15.

AMERICAN SOCIETY FOR METALS, metal congress and exposition, Public Auditorium, Cleveland—Oct. 17-21.

REGIONAL FOUNDRY CONFERENCE, Metropolitan, Philadelphia and Chesapeake Chapters of A.F.S., Stevens Institute of Technology, Hoboken, N. J., Oct. 21-22.

NATIONAL SAFETY COUNCIL, 37th National Safety Congress and Exposition, Chicago, Oct. 24-28.

GRAY IRON FOUNDERS' SOCIETY, annual meeting, Edgewater Beach Hotel, Chicago—Oct. 27-28.

MICHIGAN REGIONAL FOUNDRY CONFERENCE, A.F.S. Michigan Chapters, Michigan State College, East Lansing—Oct. 28-29.

NATIONAL FOUNDRY ASSOCIATION, annual meeting, Waldorf-Astoria Hotel, New York—Nov. 10-11.

NEW YORK STATE REGIONAL FOUNDRY CONFERENCE, A.F.S. Upstate New York Chapters, Syracuse University, Syracuse, N. Y.—Nov. 25-26.

PLANT MAINTENANCE SHOW & CONFERENCE, Cleveland—Jan. 16-19, 1950.

OHIO REGIONAL FOUNDRY CONFERENCE, A.F.S. Cincinnati District, Canton District, Northeastern Ohio, Central Ohio and Toledo Chapters, Netherlands Plaza Hotel, Cincinnati—Mar. 10-11, 1950.

54th Annual Foundry Congress and Exhibit, American Foundrymen's Society, Public Auditorium, Cleveland. May 8-12, 1950.

GOOD REFRACTORIES+PROPER USE=IMPROVED PERFORMANCE

Frank A. Czapski
Chief Metallurgist
Chicago Malleable Castings Co.
Chicago

Use of oxygen in some of the melting units of the foundry industry and the trend toward increased blast pressures is resulting in demands for better refractories. Improved refractories are essentially the responsibility of the producers and their ceramic engineers. However, since the malleable foundries will share in the benefits of any improvements, they should share the responsibility for good brick performance by properly using the brick.

Specifications, such as those of the American Society For Testing Materials, cover the physical and mechanical requirements of refractories. The foundryman's chief interest is in increased refractory life and lowest cost per unit of furnace output.

Indications are that refractories may be improving. For instance, the Malleable Founders' Society's Bulletin No. 412, issued in 1946, reports the following refractory consumption in 32 plants. Figures are reduced to 9-in. equivalents per ton of metal:

Companies Reporting	Daily Heats	Size Avg. Heat, tons	Side Wall, Bung, & Cupola Blocks
10	2	15	9.0
15	1	37	10.5
7 duplexing		81	9.5

Commenting on the survey, Bulletin No. 412 states: "In general, the super high-heat duty grades of fire brick were found most satisfactory for furnace bottoms. The standard grades continue to give good service in the side walls."

Duplexing experience in the author's plant shows a consumption of only 6.72 equivalents per ton of melt. Recorded over a 7-month period, this service record was made during a very busy time and the figures might be higher now. During the period under study refractory consumption for a total of 16,273 tons of melt was as follows:

Refractory	9-in. Equivalents per ton	Pounds per ton
Tap-out blocks	0.03	
Bungs	0.67	
Side Walls (Regular and Super Duty)	1.34	
Super Duty (Bottoms only)	1.72	
Cupola Blocks	2.96	
Fire Clay		1.5
Ganister		1.5
High Temperature Mortar		0.6
Total Consumption	6.72	

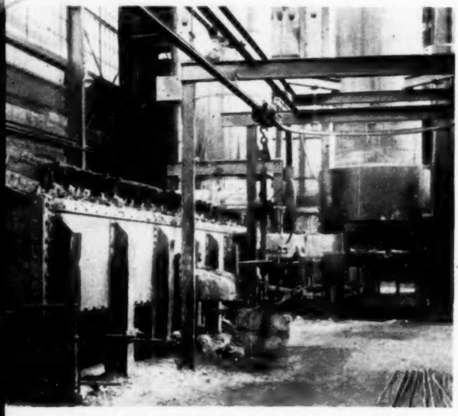
Our experience with first quality fireclay brick and super duty brick over the years indicates that there is little or no difference in actual service. This has been shown in a few tests made recently on our furnace side walls, although more data are needed to prove this is the general experience of the industry.

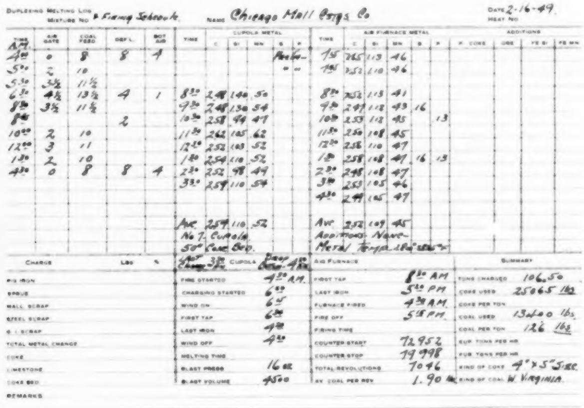
Again there is evidence that refractory brick have shown improvement during the past few years for one large malleable duplexing plant uses first quality fire brick in bottoms as well as side walls. The plant operates two shifts.

Proper use and maintenance of refractories will extend their life and avoid costly shutdowns and attendant difficulties. Brick to be used in bottom construction must be uniform in size and shape if good masonry work is to be performed.

Comparative tests on bung brick from various producers have demonstrated in our plant that the quality is generally good. Loss of valuable time and material due to bung failures has practically disappeared from

Malleable duplexing unit of 10-ton per hour capacity is served by mechanically charged cupola. Gases are consumed by waste heat boiler shown in background. A typical firing schedule is shown by the chart.





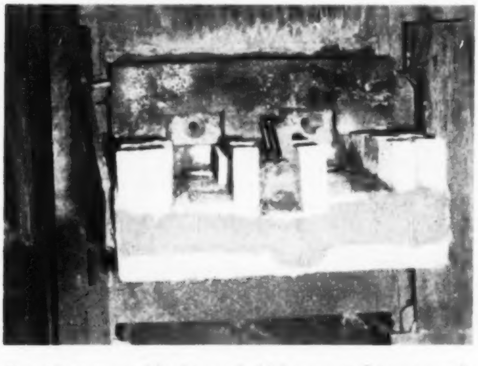
malleable foundries. Bung brick purchased by the author's plant comes from a single source. This enables the furnace men to become accustomed to proper maintenance of the one type, and this is believed to be important for good performance.

Our plant uses the conventional type of steel bung frames and these are welded into groups of three. Bung heads are kept sufficiently tight but due allowance is made for expansion without excessive pinching of the bung brick. Particular attention is paid to proper alignment, and old bungs are usually placed toward the back bridge wall.

Bungs are tightened thoroughly as laid and slack is taken up each heat during the time the furnace is being brought up to full temperature. The bolt heads are kept well lubricated with oil so they will be free and workable at all times.

Numerous plastic refractory fireclay materials are available for monolithic linings, and their application in malleable foundries is increasing. Recent comparative tests made in our plant with a plastic material containing graphite have resulted in a more comprehensive study to determine the possibility of using the material for daily cupola repairs. Preliminary work with the refractory was done on the front-slagging spout of the cupola in conjunction with 40 and 60 per cent alumina fireclay brick.

Believing that most failures of fireclay plastic linings are the result of faulty preparation and/or appli-



Outside tap-out blocks are held by a metal framework. In this frame are the two tap holes, and the one bottom hole used for draining the furnace each day.

cation, the writer's company has adopted the following mixture and procedure for ladle linings:

Fireclay, lb	250
Washed and dried silica sand, lb	1500
Western bentonite, lb	75
Water, gal	10

The mixture is mulled dry for 2 min, and the water is added gradually throughout the mixing cycle of 10 min. The laboratory sand tester sees to the proper preparation of the mixture and a foreman supervises the ramming, venting, and preheating of all ladles.

Ladles lined with the foregoing mixture should be put into service immediately following the usual slow drying and preheating treatment; otherwise, excessive

New furnace bottom being laid with wedge bricks extending about 1½ in., ready for driving tight with a sledge. A 1-in. layer of washed and dried silica sand is used between main and sub-bottom brick courses.

spalling may occur. It is worth repeating that when using monolithic refractory linings too much emphasis cannot be placed on the importance of proper mixing, venting, and preheating.

Improvements in malleable refractories have not reached the point at which the usual week-end repairs —familiar to those practicing batch-type melting or duplexing without alternating equipment—can be discontinued. Malleable foundrymen can approach this and extend the life of their refractories as well if they will prevent poor masonry work, avoid high temperatures so often due to improper firing schedules or burner settings, and eliminate excessively long holding periods after the cupola bottom has been dropped.

Submit 1950 Convention Papers Early

AUTHORS OF TECHNICAL PAPERS expected to be presented at the 54th Annual A.F.S. Foundry Congress and Show—Cleveland, May 8-12—should plan now to meet the December 15 deadline.

Papers in manuscript form should be sent in duplicate as soon as possible to the Technical Director, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill. Manuscripts will be forwarded to the appropriate committee for review and possible scheduling for the 1950 A.F.S. Convention.

Intent to submit a paper can be indicated on the Offer of Technical Paper forms available from the Technical Director. Copies of the A.F.S. GUIDE TO AUTHORS are available on request.

Acceptance of a paper for the Convention contemplates its publication as a preprint, its presentation at the Annual Meeting followed by publication in TRANSACTIONS. Some papers submitted may be published in AMERICAN FOUNDRYMAN.

THE CONSUMER VIEWS ROUGH CASTING INSPECTION

U. S. Sullivan
Foundry Inspection Div.
Caterpillar Tractor Co.
Peoria, Ill.

INSPECTION OF THE PHYSICAL CHARACTERISTICS of castings is an important operation at the author's company because castings play such an important role in the manufacture of our products—diesel track-type and wheel-type tractors, motor graders, engines and earthmoving equipment.

In the practical application of rough castings inspection, the following factors must be taken into consideration: (1) machine shop practices and methods; (2) application of the casting; (3) service in the field.

Inspection of rough castings purchased is essential because the foundry inspector cannot see the casting from the individual consumer's point of view. The consumer inspectors are trained to visualize the casting through the machine shop, into the final application and from the consumer's customers' point of view. A well trained inspector can look at a casting and tell whether it has a pattern mismatch, cope and drag shift, core shift, swells, blows or shrinks, and check the metal thickness variations with calipers.

Inspector Cooperation

Of course, defects that are found are not always rejected but held on a temporary rejection until our foundry technician of inspection has investigated the processing of the part involved. In other words, nothing is taken for granted. The inspectors learn from the decisions of the technician and know what to do when we have repeated trouble. The inspection technician works with the inspection foreman on casting trouble. Many times the inspection foreman can handle the problem from his own knowledge of castings. Also, the casting layout inspectors are used in bringing out the discrepancy by making a layout of the casting in the manner by which it may be processed.

No reflection on the foundry inspector is intended because he is confronted with variations in the rough casting which necessitate concessions. But without the knowledge of the customer's processing methods and applications the foundry inspector is unable to handle the exacting factors which the consumer must consider before the casting goes into a customer's machine.

A clean casting is a prime essential in the eyes of the consumer because of improved service from the casting and because a foundry producing a clean casting will be similarly particular in the other operations of casting production. A casting not properly cleaned can cause no end of trouble for the consumer in machine processing and in the final application. Although the castings cannot be made in a foundry finishing room, this department's work is subject to more inspection than that of any other part of the foundry.

Burnt-in sand in a casting is injurious to the consumer's machine tools and will shorten their service life considerably. Burnt sand left in oil compartments of the casting will eventually work loose and will circulate with the oil through the moving parts of the machine. This will result in damaged bearings, scuffed super finishes and occasional plugging of oil lines. Outwardly it detracts from the appearance, a factor when the finished product reaches the eventual owner.

Parting line and core fins, when not removed properly, result in a hazardous handling problem for the consumer. They also interfere with locating points when the casting reaches the machining stage. Fins which close, or cover, cored openings must be removed. Many of these cored openings are oil and water passages and fins will restrict if not entirely prevent passage. Fins around cored openings are also a hazard to the assembly operators who must work through the openings in the placement of parts within the casting, and should be removed.

Inspecting Internal Areas

Mirrors and periscopes with light attached and flash lights with flexible extensions are used for checking internal cored areas for dirt, burnt-in sand, fins and casting defects.

The removal of gates and risers causes some controversy between the consumer and vendor. From our experience removal by the vendor is important although, in rare instances, exceptions have been made after a thorough investigation of practices and the final application of the casting.

Gates and risers not properly removed will interfere with locating points in machine fixtures. In some instances the foundries have suggested that locating points be changed to compensate for such conditions. Little satisfaction will result, however, because eventual trouble with the casting due to a shrink condition or other defects will move the foundry to change location of the feeder heads and risers—and the cycle has brought us back to the original difficulty.

Fixtures can be changed to avoid locating on parting lines as we know this is a permanent condition, but

in some cases this is not feasible due to the design of certain parts. Improperly removed gates located on finished surfaces affect production since the speeds and feeds of the tool are set for maximum performance.

Our planning department makes a careful study of these functions, working from the blueprint specifications, planning the machining, tooling, speeds and feeds, etc. This phase of the job is accomplished long before the casting has even entered foundry production. Therefore, irregularities of the finish stock and heavy sections encountered on the casting will upset a well-planned schedule. Strained or warped castings will have the same effect on the machining and will cause trouble in locating the machine fixtures properly.

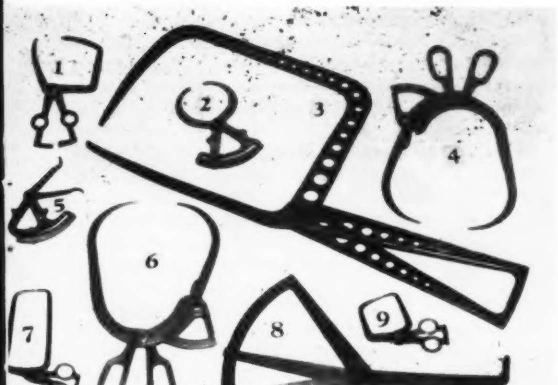
Defect Determination Methods

Besides the visual inspections for cleanliness, the inspector watches for blows, shrinks, cracks, etc. Blows are not always detrimental to a casting, but good judgment must be used when passing them into the product. Shrinks are usually detrimental because the inspector cannot be sure of their extent without sectioning or x-raying. Also, a shrink generally weakens the casting seriously and any exceptions must be made by the customer's supervisor of foundry inspection.

Our inspection methods in determining shrinks, porosity and cracks include use of the oil and chalk method and the ultra-violet method to check critical points. The oil and chalk method is used on all metals while the ultra-violet test is used principally on malleable parts such as levers, pedals and other parts checked completely for shrinks and defects because they govern the safety operations of our equipment. The oil and chalk method is very effective in finding cracks and leaks. Castings examined for leaks are parts that, in final application, contain water or oil.

Dimensional control and uniformity of the casting begins with the pattern and we, as customers, approve

The oil and chalk method is effective in disclosing cracks and leaks. The inspector has made an examination by this method, and is gaging the castings.



Above--Various types of calipers are used in casting inspection. Descriptions are given in the text of this article. Left--Surface plate inspector or layout inspector is shown using Caliper No. 4 (above) to check metal thickness of transmission case casting.

the pattern by laying out in detail the first casting developed from the pattern. This is done by the foundry layout inspector, working closely with our purchasing department, which relays to the vendor the results of the check.

Practical Gages Designed

While the casting is being studied in layout it is also checked for dimensions which must be controlled closely and gaged. If gages are necessary—recommended by the foundry inspection department—our tool design and tool room produce them. Gages and checking fixtures are made in duplicate, the vendor being supplied one and our receiving inspection department the other. Their application should be supervised to insure the customer castings within their specifications. It is our aim to design gages as simply as possible for the most practical use.

Several of the casting calipers in use are shown in the accompanying photograph. A brief description of the calipers and their particular uses follows.

No. 1—This pair of calipers has 4½-in. shanks, hardened tips and are self-reading. They will check up to 1 in. and are used to check wall and flange thickness of the majority of small castings. They are quite universal and each of our casting inspectors has a pair. They are inexpensive to make and easy to carry in a pocket.

No. 2—Calipers have 3½-in. shanks and are also self-reading. They will check up to 4-in. and have a lock nut for locking to size, and are used on outside diameters.

No. 3—These calipers have 14-in shanks, are self-reading and will check up to 2-in. They are used for checking metal thicknesses of large castings.

No. 4—Designed for general use by the layout inspectors, these calipers have 9-in. shanks and are rapid-reading.

No. 5—Calipers have 3½-in. shanks, are self-reading with lock nut and are used for checking inside measurements.

No. 6—Another view of No. 4 calipers.

No. 7—These 90-degree self-reading calipers are used for special design castings with long post openings.

No. 8—Used for general inside measurements, mani-

Cylinder block and timing gear housing castings are shown entering the machining conveyor line. The presence of a defective casting in this continuous flow of material would seriously impede production.

folds, and tubular-shaped castings, these self-reading calipers have 9-in. shanks.

No. 9—Calipers are 90-degrees, have $3\frac{1}{2}$-in. shanks, are self-reading and are used for special design castings of small type, checking up to 1 in. All calipers have hardened tips for wear resistance.

Inspectors using No. 1 and No. 9 calipers can find various deviations in castings such as core shifts, swells, thin or heavy metal sections, and check finish surfaces to see if machining stock is according to specifications.

Another type of gage, the template, the foundry itself may make and utilize when encountering small imperfections which are chronic and aggravating to the customer. The template is usually made of sheet metal, simple in design and inexpensive. Templates generally fill a temporary need and can be disposed of when no longer necessary. Some types are made of celluloid and serve for a limited time. At times when a chronic defect is noted, it has been necessary that our inspection department make a celluloid template for use until all castings produced up to the time correction was made can be checked.

Dimensional Defects Delay Machining

In the photographs of the progressive machine lines the results of interruptions due to dimensional defects or any other defects of a chronic nature can be readily seen. The machine operator expects the casting to go into the fixture without having to maneuver it or to change adjustments. Morale lags when his finished work is scrapped because of an internal defect.

Our foundry inspection department maintains close touch with the purchasing department to the end that discovery of defects noted in a casting which interrupts the machining or the application may be relayed immediately to the vendor.

This brings up the possibility of casting repair. We, as a customer, do not like repaired castings although we know that some castings can be repaired satisfactorily and without affecting the final application or service in the field. But just as our company has made itself responsible for the service of the casting on our products in the field, so will we also be responsible for the repair of the casting and its uniformity to our specifications. We believe that the customer is not out of line in requesting this because of the many factors to be considered—machinability, strength, soundness of the repair, service in the field and many other things which only the customer can determine.

Our engineers are constantly striving for better quality and longer life in our products. Therefore, foundries may expect higher specifications and more rigid inspection of the rough castings. At the same time tolerances are being reduced for a more compact machine, machine lines are being streamlined, jigs and fixtures are being designed more closely—all considerations in the job the foundry inspector must perform. Very often foundry difficulties can be traced to a lack of reference to the blueprint notations, i.e., "cast these surfaces flat and smooth," or "cast these sides parallel," or "this dimension plus or minus $\frac{1}{16}$ in.," or "clean rough casting."

Changes should never be made on a casting without first consulting the customer, and in our case even changing the location of a part number on a casting is harmful, because in the designing of the machining fixture this location of the part number has been taken into consideration to prevent location points from coming in contact with it.

Savings Made With Quality Control

Statistical quality control methods are being used extensively in our plant to determine sample sizes and tolerances for acceptance testing of castings. The use of quality control methods in setting up and maintaining uniformity of acceptance testing of castings has not resulted in saving of inspection time. However, a much better job of acceptance testing is being done, which assures more uniform castings being delivered to the machine shop where savings are then realized in reduction of production costs. The use of quality control methods in the foundry can result in savings of many types—reduced scrap, savings of materials such as alloys, etc.

The foundry has a responsibility to the user of its castings. The foundry must make certain that all points of the specifications are understood thoroughly. It should never toss off lightly some points as being impossible or unreasonable. Particularly, it should never accept specifications unless it is fully prepared to meet them.

The customer's inspectors are prepared to check the required specifications of their company and on many occasions when castings have been rejected on lack of compliance with specifications, foundrymen will report "Now that I know what you want, there will be no further trouble."

The customer appreciates periodic visits by the foundry chief inspector or engineer to its inspection department where specifications may be studied from the point of view of the customer's inspector. These visits contribute much to good relationships and an understanding of mutual problems.

IBF HOLDS ANNUAL CONFERENCE

T. Makemson, Secretary
Institute of British Foundrymen
Manchester, England

The Institute of British Foundrymen held its 46th Annual Conference at Cheltenham Spa, England, June 14-17. Not an industrial center, the town is near a number of important foundries, most of which were visited on organized tours by Conference attendants. Hosts for the meeting were the Bristol and West of England Branches of the Institute.

Newman Elected President

At the Annual General Meeting on June 15, Robert B. Templeton, Ealing Park Foundry Co., Ltd., inducted his successor, Noel P. Newman, Newman, Hender & Co., Ltd., Woodchester, as president of IBF. Elected senior and junior vice-president, respectively, were John J. Sheehan, Coneygre Foundry Ltd., and Colin Gresty, North Eastern Marine Engineering Co. Ltd. At a meeting of the Council the previous day Charles W. Bigg and Tom Makemson were re-elected honorary treasurer and secretary, respectively.

Presentation of the Oliver Stubbs Medal was made to G. L. Harbach, Worthington-Simpson, Ltd., Newark. The E. J. Fox Medal was presented to Sir Andrew McCance, of the Scottish steel firm of Colvilles Ltd., who has contributed notably to steel foundry practice and who is president of the Iron & Steel Institute. The Meritorious Services Medal was awarded to Arthur Stucliffe, retired, who for many years was with Jackson & Brothers, Ltd., Bolton. The British Foundry Medal was presented to D. H. Young of Harland & Wolff, Ltd., Glasgow.

IBF Past President Vincent Faulkner, for over 25 years editor of the *Foundry Trade Journal*, was unanimously elected an Honorary Member.

The particularly valuable series of papers presented at the various technical sessions showed that much original work has been carried on during the past year in Great Britain. Included on the program were the A.F.S. Exchange Paper, *"Some Problems in Bronze Foundry Practice,"* by Dr. Austen J. Smith of Michigan State College, and the Exchange Paper of France's Association Technique de Fonderie, *"The Organization for the Training of Apprentices in the French Foundry Industry,"* by Daniel Waeles, senior vice-president of the Association.

Following presentation of the A.F.S. Exchange Paper, which stressed the application of technical theory to the practical aspects of brass founding, the Association of Brass and Bronze Founders of Britain presented a paper on *"Mechanical Properties of Copper-Base Alloy Castings."*

Other papers presented at the Conference included *"Stress Relief Heat Treatment of Alloy Cast Iron."* by M. M. Hallett and P. D. Wing; *"The Production of Metallurgical Coke,"* by M. D. Edington; *"The Effect of Grain Shape on the Behavior of Synthetic Core and Molding Sands,"* by Dr. W. J. Rees; and *"Experiences With Ethyl Silicate in the Foundry,"* by D. F. B. Tedds.

As is usual at these Conferences, the evenings were devoted to social gatherings, including a reception given by the Mayor and Mayoress of Cheltenham, a supper dance, an organized visit to the Shakespeare Memorial Theater at Stratford-on-Avon, and the Annual Banquet, attended by 420 persons. Facilities were provided for the ladies to visit interesting parts of the Cotswolds, Bath and Bristol.

Plant Visitations Scheduled

The whole of the last day of the Conference was devoted to visitations to various foundries near Cheltenham, including President Newman's foundry —Newman, Bender & Co., Ltd., at Woodchester— and R. A. Lister & Co., Ltd., at Dursley.

The Annual General Meeting was delighted to receive a telegram of greetings from National President W. B. Wallis on behalf of members of the American Foundrymen's Society, and immediately and unanimously resolved that a suitable reply be sent.

Editor's Note: The telegram from IBF President Newman to A.F.S. President Wallis read: "Institute of British Foundrymen thank you and American Foundrymen's Society for your good wishes on occasion of our Annual Conference and send good wishes and fraternal greetings to A.F.S. with which we are so closely associated."

More than 400 foundrymen and their ladies attended the Annual Banquet of the 46th Conference of the Institute of British Foundrymen at Cheltenham Spa, England, June 14 to 17. In addition to the three-day technical program, the Conference included extensive plant visitations, the Annual General Meeting, and such social activities as a reception given by the Mayor and Mayoress of Cheltenham, a supper dance, and a visit to the famous Shakespeare Memorial Theater at Stratford-on-Avon.

HOW FOUNDRYMEN CAN ACTIVATE COLLEGE FOUNDRY COURSES

Paul N. Lehoczky
Professor and Chairman
Department of Industrial Engineering
Ohio State University
Columbus, Ohio

THE BASIC OBJECTIVES OF CURRICULA are dependent to a large degree upon the sources of pressure which are brought to bear upon the school in question. For example, a church-supported school will emphasize the religious aspects of life. A school which receives a good deal of its financial support from some trade organization or a certain section of industry will reflect the desires of such organizations in curriculum.

Ohio State University is a state-supported school and thus must first reflect the ideals and desires of the state of Ohio. It also reflects the ideals and desires of interested groups within the state. In the case at hand the foundry group within the state has asked the university to help train engineers who will enter the foundry field, and the foundry curriculum is a direct result of this request.

Numerous Factors Influence Curriculum

The curriculum then must reflect the number of influences. It must, as mentioned, reflect the desires of the state and those of the foundry industry. It also reflects the influence of the state's registration act for professional engineers. In other words, it reflects the requirements of the profession of engineering. Still further, it reflects the requirements of the Engineer's Council for Professional Development, the national accrediting organization, and which has recently re-examined us to see that our courses continued to meet its standards. It reflects the pressures of the university faculty through its Council on Instruction and through similar university control boards.

Let us look briefly at the three characteristics which are common to all engineering curricula. First, we have what is generally referred to as the fundamentals. These fundamentals are essentially "languages." Whereas the average man has one language—English—the engineer has five. These are: mathematics, physics, chemistry, drawing and, of course, English. What we mean to imply is this: two engineers can sit down and discuss a drawing because a drawing as such, has meaning to them; they can express certain ideas, certain processes, in terms of chemical formulas or in terms of mathematical formulas.

The second category consists of what is generally referred to as the technical material, and in our case goes to make up 48 per cent of the total subject matter. Under this heading are such widely diversified subjects as accounting and casting control.

NOTE: Presented at the Second Ohio Regional Foundry Conference, sponsored by the five Ohio Chapters of A.F.S. and by Ohio State University, held on the Ohio State campus at Columbus, Mar. 11-12, 1949.

The third basic group consists of what is generally referred to as the "broadening" courses. The basic objectives here, however, are broadening in terms of citizenship, and we have such courses as political science, economics, social administration, etc.

Why are these three basic characteristics common to all engineering curricla? First, because engineering is an applied science which must be based upon the fundamental sciences. This means, among other things, that the engineer must reason from cause to effect and must base his reasoning upon fundamentals rather than trying to fit his problem into the same cubbyhole that the solution of some other problem once fitted into. To paraphrase this, the solution of a problem must be justified in terms of the basic principles rather than in terms of "how we handled the same problem or a similar problem two years ago."

Second, the student's technical knowledge must be broad so that it can be connected to knowledge in related fields. We mentioned the fact that the foundry "major" takes a course in accounting (also one in cost accounting). The reason for this is that he must be able to understand what the accountant wants to know or needs to know about a foundry in terms of costs, of depreciation, of obsolescence, and the like. We are not training accountants; neither is the accounting department training engineers. Someone must have a sufficient knowledge of the other's field to be able to understand the other's thinking and so harmonize the two branches of the plant operation.

Specific Foundry Courses

Considering the specific courses in the foundry curriculum, taking them in alphabetical order and by departments, we have the following. Accounting has already been mentioned. We have a course in corporate organization and control which is handled in the College of Commerce. Also in this college we take courses in general economics, labor economics, economic geography, and social administration. We take two courses in ceramic engineering, one dealing with general purposes of ceramic materials and the other with specific ceramic materials used in the foundry. Then we take a number of courses in chemistry, four in engineering drawing, four in English and seven in mathematics.

In the later group is one course which follows the three courses given in calculus and which deals with the basic concept of mathematical statistics. This course later is used as the basis for the statistical quality control course given in the Department of Industrial Engineering. Our men take two courses in electrical engineering including electrical machinery and electronic controls; three courses in physics, a course in thermodynamics, two in metallurgy, two in mechanics including strength of materials, two courses in machine shop, one course in welding and heat treating, and such courses in industrial engineering

Dr. Lehoczky has, in the accompanying article, done much to remove the shadow and mysteries which exist in the layman's mind concerning the development and content of an engineering curriculum. His matter-of-fact and business-like presentations have resulted in a readable and readily understood description of the thinking and reasoning which went into the development of the foundry program at Ohio State University. A study of this article will do much to promote an understanding and acceptance of engineering education by foundrymen and will be a revelation to some university graduates of past decades.

—George K. Dreher, Foundry Educational Foundation.

as are taken by all industrial engineering majors.

This later category includes courses in motion and time study, wage incentives and job and wage evaluation, personnel management, engineering economy, production control, statistical quality control, general plant management, safety engineering, chart control and others. In addition are the specific courses which apply only to the foundry, and these then include the following:

An introductory course in foundry technology is taken not only by the foundry majors but also by all industrial engineers, all mechanical engineers and welding engineers. This course includes laboratory practice in bench, floor, and machine molding; in cupola operation and in coremaking. Lectures cover fundamental concepts concerning volume changes which occur when alloys cool, materials of all kinds used in the foundry and molding practices. Lectures also touch on founding losses and mass production methods.

Foundry majors take a course in foundry materials which is a counterpart of the course given in the ceramic engineering department. The latter deals with ceramic materials, and that given in the foundry department with non-ceramic materials.

The next course taken by foundry majors is known as foundry molding methods. It involves a study of the fundamentals of making foundry molds by machine and by hand methods. The course includes a thorough study of gating and risering.

Next the student takes a course in foundry casting control. This course briefly correlates the one dealing with molding methods and the two dealing with foundry materials with respect to casting difficulties. The next course in line taken by the foundry majors is called foundry casting methods. This course contains a description and an analytical study of investment, die, centrifugal, permanent mold, vacuum and slush casting methods.

Then follows a course in the heat treating of castings, which involves an analytical study of heat treating principles as they apply to foundry practices. The basic principles of heat treating are covered in a course given by the metallurgy department. Finally, the student has a course in foundry melting methods. Here we have an analytical study of melting methods used in the production of castings.

So far only specific courses have been mentioned, all of which are required of every student majoring in foundry technology. Aside from these are courses which the student may take on an elective basis. Each student has a right, in fact is required, to elect 23 hours of technical courses and 15 hours of non-technical courses. Referring now to the technical electives, he may elect courses in design, metallurgy, research work of some type, ceramic engineering, or in management, or in a combination of these.

In brief, he is free to specialize in some phase of foundry work of his own choosing. There is also the option of working toward both a bachelor's and a master's degree within the five-year period. If the student can quality for this program much of his 23 technical hours is forced into graduate work in foundry technology.

It should be obvious that the man who graduates from this program still has a great deal to learn. Although each man is required to spend two summers in a foundry, it will take a great deal more than such experience affords to make him a first-class foundry technologist. We cannot teach practical experience but we can train in fundamentals; we are confident that we are preparing a man who is willing and able to work hard and who, because of the broad, yet intensive training he has received, has the wherewithall to rise rapidly in the field of his choice, the foundry.

Cast Iron Soil Pipe And Fittings Manufacturers Form An Association

Comprising 26 of the 35 manufacturers in the United States, an association, to be known as the Institute of Cast Iron Soil Pipe and Fittings Manufacturers was formed June 1, with Robert Dick as executive secretary.

President of the new organization is J. J. Nolan, Jr., vice-president, Central Foundry Co., New York. Other officers are: George L. Harberger, Eastern Foundry Co., Boyerstown, Pa., vice-president; and Deems W. Hallman, Hajaca Corp., Philadelphia, treasurer.

Members of the Executive Committee are Charles A. Hamilton, Alabama Pipe Co., Anniston, Ala.; William Deyo, Anniston Foundry Co., Anniston, Ala.; and Mr. Nolan. The office of the executive secretary will be temporarily located at 490 Bleeker Ave., Mamaroneck, N. Y.

Mr. Dick, the new executive secretary, was previously associated with the Lead Industries Association for several years, and more recently with the Eagle-Picher Lead Co. for five years.

Revert To Cast Iron Cylinder Blocks

Cast iron cylinder blocks have replaced the brazed steel stamping structures formerly used in Crosley automobiles. Excessive noise developed in the otherwise satisfactory steel blocks. Cast iron has long been used in structures in which damping capacity—ability to absorb vibration—is an important factor. The high damping capacity of cast iron is a function of the graphite flakes. According to the A.F.S. Cast Metals Handbook, the effective strength of a vibrating part may be much greater if made with a material of high damping capacity and only fair strength than if made of a much stronger material of low damping capacity—the latter allowing vibrations to build up to a serious intensity while the former will "damp" them out.

Questions THE ROUND TABLE Answers

Plans Small Brass Foundry

I am building a small brass foundry as a hobby and side line and I would like to obtain some formulas on mixing brass, such as hard brass, bearing metal, etc.; also for making hard copper such as is used in soldering irons.

For the type work outlined, it is suggested that a supply of the following virgin metals be obtained: copper, tin, lead, zinc, and aluminum.

By alloying according to these proportions a wide range of brasses and bronzes can be obtained:

Composition, per cent						
Cu	Sn	Pb	Zn	Al	Hardness	Properties and Uses
90				10	High	Strong and ductile; good acid and wear resistance.
80	20				High	Strong, rigid and brittle; good for bells and chimes.
88	8		4		Med. High	Medium high strength bronze: good high-speed low-load bearing.
88	10	2			Medium	Medium high strength bronze; free machining.
85	5	5	5		Med. Low	Low strength, general purpose; free machining bronze.
80	10	10			Med. Low	Good general purpose bearing.
70	10	20			Low	Heavy duty bearing.
70	5	25			Very low	Medium duty bearing.

Generally speaking, the procedure in melting and alloying would be as follows:

Weigh out your charges accurately. Melt the copper fast in a hot furnace with an oxidizing flame. When molten, deoxidize the copper thoroughly with lithium, silicon, zinc or phosphor copper. Add to the molten copper the low melting point alloying elements which have preferably been concurrently melted and mixed in another furnace. If this is not possible, the low melting point alloying elements should be added to the copper charge only after being thoroughly preheated above 212 F to drive off any moisture.

To reduce the possibility of gas pick-up in the metal during melting and alloying and to obtain better homogeneity in the melt—especially with the high lead containing alloys—it is best to stir the melt well and pour into pig. Then remelt before pouring into castings.

For soldering coppers, use a good grade of electrolytic and melt and deoxidize as above. Do not alloy it. Cast to shape and forge hot on an anvil with a hammer. Work to size and shape first with hammer and then with file. Helve it to suit your wishes.

For more detailed information on handling these alloys consult the A.F.S. Cast Metals Handbook, Recommended Practices for Sand Casting Non-Ferrous Alloys and the A.S.M. Metals Handbook.

Clausen A. Robeck, Vice-President
Gibson & Kirk Co.
Baltimore, Md.

Wants To Maintain Bed Height

We are operating a 48 in. cupola using a 50 in. bed, 16 oz pressure, 4100 cfm air, air weight control, 1000 lb metal charges and 125 lb coke charges. Heats run several hours. What is the correct way to calculate the amount of extra coke necessary to keep the bed up to the right height? What is the best way to add extra coke—double charges every four to six charges? Are there any quick tests to tell whether the bed height is satisfactory other than metal temperature? How much coke should be dropped at the end of the heat? Can the amount of coke between charges be reduced and how much, after the first hour or so of operation?

We can see nothing particularly wrong with your figures. The bed height will tend to remain constant if it was of proper height initially, if the proper amount of air is entering the cupola, and if the bed coke is being replenished by the intermediate charges or coke splits at the rate at which it is being burned. Best height can be established most satisfactorily by actual experimentation under your particular operating conditions.

If you wish to vary your bed height, do so by steps of three to four inches, making an accurate record each day of the time the blast goes on, the time of appearance of the first droplets of molten iron at the tuyeres, the time to the first steady stream of molten iron at the tap hole, time of botting, and elapsed time to the first tap of iron. In addition, using an accurately calibrated pyrometer, you should measure the temperature of the first steady stream of molten iron, the temperature just before botting, and at 15 min intervals throughout the entire heat.

If the height of the bed is varied it is well to run several heats in order to make certain that the observed information is truly indicative of conditions

which can be duplicated. Having once established the optimum bed height, the maintenance of metal temperature at the spout indicates that the weight of the coke charge has been properly chosen. If the charges are excessive the bed will gradually build up, temperature will fall and melting rate will decrease. If the bed is gradually depleted the temperature will drop, melting rate will not be greatly affected, and the iron will give evidence of being oxidized as shown, for example, by increased chill depth.

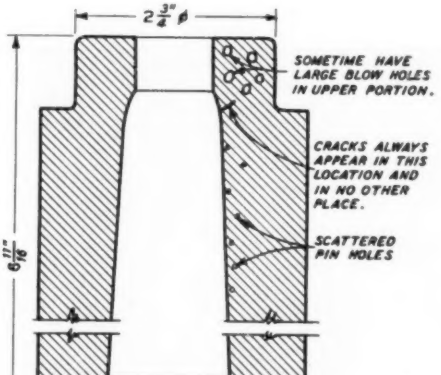
The intermediate charges of coke should be varied in 10 to 20 lb increments and several days operation should be used as a guide before making further changes. Having once established the optimum height of bed and weight of intermediate charges the procedure should be rigorously followed to achieve uniformity of operation. We strongly recommend against the use of double charges, preferring instead, uniform intermediate charges of coke.

The amount of coke that is dropped with the bottom can readily be estimated from the dimensions of the cupola and the height of the bed.

Recommended bed heights and other operating conditions, as well as complete details on every phase of cupola operation are contained in HANDBOOK OF CUPOLA OPERATION recently reprinted by A.F.S. in response to popular demand.

Loses 80 Per Cent Of Castings

Enclosed is a drawing of a mold used in the glass industry. The inside surface must be close grained cast iron completely free of pin holes. We cast the pieces with an internal chill which is solid for small sizes and hollow for the larger sizes. We have around 80 per cent loss in this type of casting due to cracks as indicated, blow holes at the top as shown and pin holes scattered from midway to the top. Castings are made with the small end up and a large gate at the bottom. We have tried gates at the top, no gates, removing the chill before cooling, removing the chill after cooling, and varying the pouring temperature. We make many other types of bottle molds which are split in half and with which we do not experience any of these difficulties.



The pin holes may be due to dampness on the chiller itself. In order to avoid this we suggest the chillers be heated to approximately 250 F just prior to inserting them in the mold. In very humid weather and particularly when the mold remains closed for a long period of time prior to pouring, it is not uncommon to have moisture from the green molding sand condense on the cold chiller, causing pin holes when the molten metal enters the mold.

It may prove helpful to coat the surface of the chiller with a thin coating of lamp black suspended in shellac. The coating must be well dried before using otherwise the alcohol vapor from the shellac will cause pin holes.

The larger blow holes at the top of the casting may be due to insufficient pouring temperature or inadequate venting of the mold at that point. Cold metal will solidify before entrapped gases can escape. Some benefit may be gained if the gate enters the casting tangentially so that the metal will swirl into the mold.

The cracks in the shoulder at the top of the casting are probably due to hot tearing when the casting shrinks around the chiller. Since the casting is thinnest at this point it will solidify first and will be at some temperature just below solidification, where its strength is low during the first stages of contraction. Early removal of the chiller should avoid the hot tears.

How To Mechanize A Foundry

I am designing an iron foundry and would appreciate receiving any data you may have on the latest methods of laying out iron foundries and the handling and treatment of sand and cleaning of castings.

Most recent article on foundry layouts is *"6 Ways to Mechanize a Foundry"* which appeared in the April, 1949, issue of AMERICAN FOUNDRYMAN, pages 79-90. Tear-sheets of this authoritative, well illustrated paper have been forwarded.

How Soon May A Casting Be Shaken Out?

What time interval should be allowed between pouring and shakeout of gray iron castings?

Shakeout time is a function of the composition of the metal, the pouring temperature, casting size and shape, and end properties essential in the finished castings. In addition the varying thermal conductivity and heat capacity of cores and molding sand must be considered.

Our suggestion is that you establish shakeout times for the various castings—assuming that sufficient quantities are being made to justify such observations—by shaking out the castings at various time intervals following pouring. If the casting has solidified but is still above the transformation temperature for the particular composition, final hardness will be strongly

influenced by the shakeout temperature. A harder casting will result if the temperature is above the critical point and the casting, in effect, is air quenched.

In complicated sections, residual internal stresses are likely to be high if the shakeout temperature is above 700 to 800 F.

The A.F.S. Heat Transfer Research Project at Columbia University has resulted in a sizeable amount of information on the rate of solidification of steel and pure aluminum castings, but up to the present has not been expanded to gray iron castings. Reason is the complex nature of gray iron and the long solidification range. After present planned investigations have been completed gray iron will be studied.

Troubled With Sand Inclusions

We have been troubled with cast iron cylinders and cylinder heads impregnated with abrasive particles which scratch and cut steel shafting. We bored out a cylinder head and caught the chips on a lean piece of paper. Picking up the chips with a magnet, we found we had left some white and cream colored particles. These were powdery and upon smashing we found very small particles of a substance which looked like glass or quartz.

If glass entered the cupola with the charge could this condition result? Could core or molding sand enter the casting a distance of 1/4 in?

The non-magnetic particles are entrapped silica sand from the mold or core, or possibly slag. It is quite improbable than any glass which might have entered the cupola would be carried into the mold. Instead it would become part of the slag and lose its identity as glass.

Examine your molding practice to make sure molds are clean when closed and are protected from sand falling into the sprue. Sand inclusions can also be caused by cutting and washing of the sand, particularly in the sprue and gate, and by sand of low green or dry strength which falls from the cope during pouring.

Sand Sticks In Hoppers

We are having considerable difficulty with sand sticking in our hoppers. Is there some material that can be sprayed on the inside of the hoppers that will prevent this? Our hoppers have three vertical sides with the fourth at about a 70 degree angle. Vibrators on each hopper vibrate when the gate is opened.

Your trouble may be in the gate at the bottom of the hopper. Difficulty such as you describe frequently arises with a typical clam shell gate, especially when the molder is inclined to open the gate only partially. Under these circumstances, sand tends to build up immediately adjacent to the gate and eventually cuts off the flow of sand. Gate designs are available which largely obviate this trouble.

A rust preventive oil can be used to coat the bins. It prevents formation of heavy scale due to rusting, thereby keeping the bin relatively smooth. The effectiveness of such an oil coating is of short duration and, to be consistently effective, has to be applied at regular intervals.

ASA Has Pipe Standards

We manufacture malleable iron threaded pipe fittings and are interested in getting a complete set of standards used in the United States.

American standards covering malleable iron pipe fittings can be obtained from the American Standards Association, Inc., 70 East 45th St., New York 17.

Chemistry Students View Pig Iron Production Operations

Jackson (Ohio) High School senior chemistry students saw iron production from ore to pig when they visited the Jackson Iron & Steel Co. recently. Guide was Wilfred H. White, JISCO metallurgist, who explained operations and equipment and described the production of pig.

Letters to the Editor

Regrets Membership Resignation

I find it necessary to present at this time my resignation as a member of the American Foundrymen's Society effective with the completion of my current membership year, June 1.

This is due to the change, on February 1, of my position together with a change in type of technical activity. These facts have necessitated some changes in the technical societies to which I belong.

Membership in A.F.S. was most helpful to me and I regret this necessity.

A. P. Thompson
Director of Research
The Eagle-Picher Co.
Joplin, Mo.

Approves Dues Increase To Sustain A.F.S. Work

I am in agreement with the reasons for the necessity of adjusting the finances of the American Foundrymen's Society by means of an increase in membership fees.

The work of the Society is so notable and important that I feel it is my duty to sustain it in any way possible in order that its activities may increase and not meet with obstacles on account of lack of funds.

Prof. Antonio Scortecci
Istituto Siderurgico
Genoa, Italy

Says *American Foundryman* Worth A.F.S. Membership Fee

I have just finished reading the May issue of American Foundryman from cover to cover and I wish to compliment you on a very interesting and outstanding issue of a magazine that has always maintained a high standard of quality.

It is difficult to indicate the parts I enjoyed most. The Letters-to-the-Editor page is a most interesting addition. I also enjoyed particularly the article "Dielectric Core Baking" by J. W. Cable.

The value of American Foundryman to me is much more than my small membership dues to the Society.

E. J. McAfee,
Master Patternmaker
Puget Sound Naval Shipyard
Bremerton, Wash.

Enjoyed Instructive Tour Of American Foundries

Belgium is not more than 200 miles across at the largest place. It is a country of dense population which should export an important part of its products to obtain in exchange the products and machines which it needs so greatly. Means of existence are supplied, for the most part, by industrial activity.

Economic progress in Belgium has been arrested by two disastrous and odious military occupations, totalling 10 years, in the course of 35 years. During these two occupations the plants could have been active. However, none of them improved their potential of manufacture; on the contrary, everywhere the spirit of resistance led to the sabotage of all of the means of production.

After the liberation, the efforts of each person tended toward putting the equipment in order again, renewing it and modernizing it insofar as possible.

Belgian industry is made up of many small units—the average foundry employs 35 to 40 persons. With the exception of a small number of businesses, the problem of the Belgian foundry consists in modernizing the plants whose daily production will be about 10 tons.

In the course of this trip, during which our American colleagues have been very frank and cordial, we were making an effort to see how we could bring to these small foundries the changes in processes of manufacture and methods of organization, to permit them to take a worthy place again in world-wide activity—perhaps from a past which is not without lustre. In any case, our desire is to do well.

We have been strongly impressed by the fine installations in the foundries visited in America. They illustrate a sure and progressive technique, both in the general layout and in the techniques of melting, sands, molding and pouring. It can truly be said that in your foundries you come very close to perfection.

This is the lesson which I have taken from you and which you have given me without reservation and in a very friendly way. When I return to my country, I shall consider it a duty to make use of the information I have gained and to help my compatriots benefit by it. I am convinced that one of the ways to show you my gratitude for the reception I received, would be to succeed and be able shortly to give an opportunity to those of you who may wish to visit us, to see what we have been able to accomplish in your image and on the Belgian scale. Thank you.

J. Leonard, *Civil Engineer*
Liege, Belgium

A past president of the Belgian Technical Foundry Association and of the International Committee of Foundry Technical Associations, Mr. Leonard's reception here—while studying foundry production methods to help improve operations in the relatively small foundries of highly industrialized Belgium—exemplifies the brotherhood which exists among foundrymen. We are pleased to have him use "The Foundrymen's *Own* Magazine" to express his thanks and appreciation to the foundrymen of America. —*Editor.*

BOOK REVIEWS

Metallography

Principles of Metallography, by Robert S. Williams, S.B., Ph. D., and Victor O. Homerberg, S.B., P.D., Sc.D. Fifth Edition, 319 pp. Illustrated with drawings, charts and diagrams. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. $4.00. (1948).

The fifth edition of this standard textbook, like its predecessors emphasizes metallography rather than the physico-chemical principles involved, but does not neglect the fundamental precepts of metallography. Written by professors of physical metallurgy at Massachusetts Institute of Technology, *Principles of Metallography* is designed to meet the needs of engineering students who do not intend to specialize in metallography but who intend to use its principles in connection with their work. The text has been thoroughly revised in accordance with new practices developed during World War II. Sections dealing with non-ferrous alloys have been enlarged and revised, and additions have been made to the sections on alloy steels, cast irons and case hardening. The section on hardening and tempering of steel has been expanded and a discussion of hardenability has been added, among other revisions.

Powder Metallurgy

Treatise on Powder Metallurgy, Vol. I of a three-volume *Technology of Metal Powders and Their Products* series, by Claus G. Goetzel, Ph. D. 806 pp, 300 illustrations, 82 tables. Published by Interscience Publishers, Inc., New York. $15.00. (1949).

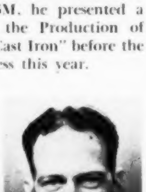
Encyclopedic in its treatment of the subject of powder metallurgy, this volume is equally useful as an introductory text, a reference book, a source for new applications and as a stimulus to new developments in the field. The fundamentals covered in this treatise include terminology, history and basic principles—followed by chapters describing methods of powder production, characteristics, properties and standards of available powders, testing and conditioning methods, and the function of additive agents. Also ex-

(Continued on Page 93)

WHO'S WHO


G. E. Holdeman

G. E. Holdeman, co-author with J. C. H. Stearns of *"Variables in Producing Nodular Cast Iron by Magnesium Treatment,"* Page 36, is research metallurgist for the Dow Chemical Co., Midland, Mich. . . . Born in Elkhart, Ind., Mr. Holdeman attended Purdue University, receiving his B.S. in Chemical Engineering in 1934 and an M.S. in Engineering in 1936 . . . Upon graduation, he became a research assistant at the Purdue Research Foundation and shortly afterwards joined Dow . . . A member of A.F.S. and ASM, he presented a paper, "Variables in the Production of Nodular Graphite in Cast Iron" before the Western Metal Congress this year.


J. C. H. Stearns

J. C. H. Stearns, co-author with G. E. Holdeman of *"Variables in Producing Nodular Cast Iron by Magnesium Treatment,"* Page 36, is manager of Ingot Sales for Dow Chemical Co.'s Magnesium Division . . . A native of Washington, D. C., he attended Johns Hopkins University in Baltimore from 1930 to 1933, completing work toward his bachelor's degree at George Washington University in 1936 . . . From 1933 to 1937, Mr. Stearns was assistant to a Washington, D. C., consulting engineer, joining Dow in 1937.


P. N. Lehoczky

Paul N. Lehoczky, author of *"How Foundrymen Can Activate College Foundry Courses,"* Page 60, has had wide experience in educational, Governmental and industrial phases of employee relations . . . Holder of a B.S. in Mechanical Engineering from the Case Institute of Applied Science (1927), and an M.Sc. from Ohio State University (1928), he received a Ph.D. from Ohio State in 1931 . . . Following a four-year period with the Dow Chemical Co. and the Industrial Fibre Co., Dr. Lehoczky joined the faculty of Ohio State University as an assistant in Industrial Engineering in 1928, becoming successively instructor (1930-33), assistant professor (1933-39), associate professor (1939-43), professor (1943), and since 1944 chairman of the Industrial Engineering Department . . . He has also served as foreign editor for *Automotive Abstracts* (1928-31), research engineer for the Ohio Industrial Commission (1940-41), chairman of the Wage Stabilization Panel of the National War Labor Board in 1943, and as a member of several national arbitration boards since that date.


U. S. Sullivan

U. S. Sullivan, author of *"The Consumer Views Rough Castings Inspection,"* Page 56, is general supervisor in charge of all inspection departments of Caterpillar Tractor Co., Peoria, Ill., and has several times presented papers on inspection of rough castings before meetings of A.F.S. and other technical societies. . . . Mr. Sullivan joined the General Motors Corp. at Anderson, Ind., after leaving college in 1924, as an inspector and later as an assistant foreman . . . In 1934, Mr. Sullivan became an inspector for Caterpillar and was appointed foreman in 1939 and general foreman in 1942.


B. H. Booth

Bradley H. Booth, author of *"Moisture in Bentonite Influences Strength,"* Page 50, is the author of this year's A.F.S. Exchange Paper to the Institute of Australian Foundrymen . . . He is chairman of the A.F.S. Sand Division's Green Sand Properties Committee, and has been a frequent speaker at local, regional and national meetings of the Society . . . After attending the Universities of Illinois, New Hampshire and Wisconsin, Mr. Booth joined the Laconia Malleable Iron Co., Laconia, N. H., as a chemist . . . He has been, successively, metallurgist for the Illinois Malleable Iron Co., Decatur, Ill.; metallurgist, Jackson Iron & Steel Co., Jackson, Ohio; and is today foundry engineer for Carpenter Brothers, Inc., Milwaukee. Mr. Booth is a frequent contributor to the technical press and is a member of A.F.S., AIME and ASM.


J. R. Walley

John R. Walley, author of *"Waste Control Reduces Costs,"* Page 42, is supervisor of standards for the Ohio Steel Foundry Co., Springfield, Ohio . . . After studying time study and methods at Michael's School, Inc., Cincinnati, the University of Cincinnati and Miami (Ohio) University, Mr. Walley began as time study analyst with Harris-Seybold Co., Dayton, Ohio, in 1937 . . . Left there to join the National Cash Register Co. in the same capacity in 1940-41 . . . From 1943 to 1946, Mr. Walley was methods engineer for the Master Electric Co., at the same time serving as motion and time study engineer for the Standard Register Co. . . . Mr. Walley returned to Harris-Seybold in 1946.


T. O. Kuivinen

Thomas O. Kuivinen, author of *"Designing Iron Crankshafts and Centerframes for Diesel Engines,"* Page 28, is administrative engineer for the Cooper-Bessemer Corp., Mount Vernon, Ohio . . . A Mechanical Engineering graduate of Ohio State University, Mr. Kuivinen worked summers for the West Virginia Rail Co. as a draftsman and as a part-time instructor in mechanical drawing while attending Ohio State . . . Upon graduation in 1929, he joined Cooper-Bessemer as an engineer and has since been calculations supervisor, assistant to the chief engineer, and is presently administrative engineer with that organization.


H. J. Cooper

Herbert J. Cooper, author of *"Oxygen Injection Process in Melting Low Carbon Cr-Ni Stainless Steel,"* page 44, graduated from Columbia University's Engineering School last year with an M.S. in Metallurgy . . . While at Columbia, Mr. Cooper was elected to Tau Beta Pi, honorary engineering fraternity, and in 1948 was

awarded the Rhodes Prize in Metallurgy . . . After serving two months as a student engineer with the Bethlehem Steel Co., Mr. Cooper joined the Cooper Alloy Foundry Co., Hillside, N. J., in August, 1948, as a research and development engineer . . . Mr. Cooper served in the Navy from 1943 to 1946 with the rank of Ensign . . . He has written for the trade press on centrifugal casting of alloy steel in permanent molds and is a member of AIME, ASME, and the Alloy Castings Institute.

G. K. Dreher

George K. Dreher, author of "*Your Stake in Engineering Education,*" Page 33, needs little introduction to foundrymen . . . As executive director of the Foundry Educational Foundation, he has been instrumental in forwarding the interest of the foundry industry in engineering schools and colleges, and in inducing engineering students to make the foundry industry their career . . . A graduate of Lawrence College in 1929, Mr. Dreher joined Ampco Metal, Inc., Milwaukee, the following year, becoming vice-president by 1946, when he was appointed vice-president and general manager of the Rogers Pattern & Foundry Co., Los Angeles, and in 1947 was appointed the first executive director of the Foundry Educational Foundation . . . Mr. Dreher has long been active in A.F.S. committee work, is a past National Director of the Society, and is past chairman of the Wisconsin Chapter of A.F.S.

F. A. Czapski

Frank A. Czapski, *author of "Good Refractories + Proper Use = Improved Performance,"* Page 54, is chief metallurgist for the Chicago Malleable Castings Co. Born in LaSalle, Ill., Mr. Czapski received a B.S. in Chemical Engineering from the University of Illinois in 1927 . . . He was employed by the Robert W. Hunt Co., Chicago, as a chemist from 1928 to 1931; by the Belle City Malleable Iron Co., Racine, Wis., in the same capacity from 1931 to 1934; and has been with the Chicago Malleable Castings Co. since 1934.

J. A. Shuffstall

J. A. Shuffstall, author of "*Gating Controls Temperature Gradients in Steel Casting,*" Page 52, is a frequent contributor to the trade press and has spoken before many A.F.S. groups . . . Following completion of courses in Metallurgical and Mechanical Engineering at the Erie Extension of Penn State College, Mr. Shuffstall became an apprentice patternmaker at National Erie Corp., Erie, Pa., in 1923 . . . He was, successively, patternmaker, patternmaking foreman, chief inspector, foundryman, production manager, assistant plant manager, and is today plant manager for National Erie.

A. F. S. Employment Service

To contact firms seeking personnel through "Help Wanted" items write to American Foundrymen's Society, 222 West Adams St., Chicago 6, designating Item Number and issue of AMERICAN FOUNDRYMAN in which published. A.F.S. Applicant Registration Form then will be sent to applicant for filling in and returning to A.F.S. Headquarters. The form will then be sent by Headquarters to the firm.

HELP WANTED

HW507—Metallurgical Sales: An attractive metallurgical sales development position is available in Detroit for a graduate metallurgical engineer who is 30 to 36 years old and who has had experience in the production of cast iron.

HW508—Pattern Shop Supervisor: Need man to head 15-man pattern shop. Good opportunity. Non-ferrous foundry. Write, giving experience.

HW509—Sales Engineer: Prominent grinding wheel manufacturer has opening for experienced man with successful record selling industrial product direct and through industrial supply distributors to metal-working plants in New England. Excellent opportunity for right man. State experience, references and salary expected. Detailed replies held in confidence.

HW510—Research Position: Investigatorship in an Eastern University with an opportunity to work for advanced degree in Metallurgical Engineering. Available to man with degree in Met. E. or Metallurgy and with some experience. Research problem related to foundry technology.

AUGUST 12
CENTRAL OHIO
Brookside Country Club, Columbus
ANNUAL OUTING

AUGUST 13
CHICAGO
Lincolnshire Country Club, Crete
STAG PARTY AND GOLF OUTING

AUGUST 20
WESTERN MICHIGAN
Pontaluna Golf Club, Muskegon
ANNUAL PICNIC

AUGUST 27
ONTARIO
Estate of Ralph Barnes, Waterdown, Ont.
ANNUAL PICNIC

SEPTEMBER 4
BIRMINGHAM DISTRICT
Roebuck Country Club, Birmingham
ANNUAL OUTING

SEPTEMBER 8
NORTHEASTERN OHIO
Tudor Arms Hotel, Cleveland
W. H. JOHNSON
Naval Research Laboratory
"Finger Gating and Step Gating"

SEPTEMBER 8
ST. LOUIS DISTRICT
York Hotel, St. Louis
SUBJECT TO BE ANNOUNCED

SEPTEMBER 10
CANTON DISTRICT
Alliance Country Club, Alliance, Ohio
ANNUAL PICNIC

SEPTEMBER 17
ROCHESTER
Barnard's Exempt Firemen's Association, Pomona Drive at Dewey Ave., Rochester
ANNUAL PICNIC

FOUNDRY *Personalities*

Howard E. Pellett, formerly research supervisor for the Republic Steel Corp., has been appointed sales engineer for the Riehl Testing Machines Division of American Machine & Metals, Inc., and will cover California, Nevada and Arizona. Mr. Pellett will maintain offices at 1201 Folsom St., San Francisco, and 416 West Eighth St., Los Angeles.

A. W. Silvester and **John Watt** of Russell Mfg. Co., Pty., Ltd., Melbourne, Victoria, Australia are completing a four months' tour of the United States, during which they have visited foundries and machine shops in the major manufacturing centers. A recent visitor at A.F.S. Headquarters, Mr. Silvester presented the Exchange Paper from the Institute of Australian Foundrymen at this year's A.F.S. Convention in St. Louis. The paper, *"Graphitization of Gray Cast Iron by Heat Treatment,"* will appear in A.F.S. TRANSACTIONS, available approximately November 15.

A. W. Silvester

K. W. Rhoads will handle sales in the metropolitan New York, New York State and New England areas for the Detroit Electric Furnace Division of the Kuhlman Electric Co., Bay City, Mich. Mr. Rhoads, who has been associated with the Detroit Electric Furnace Division for six years, will be located at the company's Eastern Division sales office at 420 Lexington Ave., New York.

Sands G. Falk has been appointed manager of foundry sales for the Falk Corp., Milwaukee, succeeding **John S. Wilkinson,** who will become foundry sales consultant when he returns from a European trip, October 1. A graduate of the University of California, Mr. Falk has been associated with the company for 10 years—the last five years as assistant manager of foundry sales. Mr. Wilkinson, who has been with the company since 1905, will serve as consultant for three months, then retire.

J. A. Durr, has resigned his position as technical adviser to the general manager of the Albion Malleable Iron Co., Albion, Mich., and since August 1 has been in business for himself as a consultant to the foundry industry, specializing in scrap and man-hour reduction. Mr. Durr's business address is Box 8, Albion, Mich.

Charles A. Fitz-Gerald, for many years pig iron sales representative in the Midwest, has resumed active representation for the Sloss-Sheffield Steel & Iron Co. of Birmingham, Ala., in the St. Louis and Chicago territories. Mr. Fitz-Gerald has been with Sloss-Sheffield since 1904.

Sterling G. Maisch recently succeeded the late Charles H. Hunt as production manager of the Axle Division of the Eaton Mfg. Co., Cleveland. Mr. Maisch, who has been with Eaton since 1943, was formerly with the West Steel Casting Co., Cleveland, and the Standard Oil Co.

Frank M. Goodman has been appointed sales promotion manager for the Industrial Division of the Lincoln Engineering Co. Mr. Goodman was formerly with Skilsaw, Inc.

Alexander H. d'Arcambal, vice-president and consulting metallurgist for the Pratt & Whitney Division of Niles-Bement-Pond Co., West Hartford, Conn., was recently the recipient of an honorary degree in metallurgical engineering from his alma mater, the University of Michigan.

Warren M. Pike has been appointed New England Representative for the Farrell-Birmingham Co., Inc., Ansonia, Conn., and will make his headquarters in Boston.

Hubert C. Smith has been appointed assistant vice-president in charge of Metallurgical Control for the Great Lakes Steel Corp., Ecorse, Mich., where he was formerly chief metallurgist. Prior to joining Great Lakes, Mr. Smith was chief metallurgist for the Otis Steel Co. and during the war served the Government as an Army Ordnance consultant, inspecting captured enemy steel production facilities in Europe.

Milford R. Waddell, industrial and public relations director for Black, Sivalls & Bryson, Inc., Kansas City, Mo., was recently elected a vice-president and membership chairman for the National Industrial Advertisers' Association.

H. K. Clark, president of the Carborundum Co., Niagara Falls, N. Y., was elected a trustee representing the grinding wheel industry on the Board of the Industrial Hygiene Foundation, Pittsburgh.

Charles H. Cousineau has been appointed sales and service engineer for Carpenter Bros., Inc., Milwaukee, and will be in charge of the company's Michigan office, located at 1832 Ruddiman Drive, Muskegon. Since his graduation from the University of Michigan in 1939, where he majored in metallurgy and chemical engineering, Mr. Cousineau has been associated with the West Michigan Steel Foundry Co., Muskegon, as metallurgist; Hill & Griffith Co., Cincinnati, as field service engineer; and Lakey Foundry & Machine Co., Muskegon, as sand research engineer.

C. H. Cousineau

William R. Kalbach, who has been head of service work in the New York district of the Hagan Corp, has been made a sales and service engineer for the company's Cincinnati office.

William B. Given, Jr., president of the American Brake Shoe Co., New York, was recently a speaker at a luncheon given at New York University on behalf of the Bellevue Medical Center Fund. Mr. Given cited America's need for properly trained medical school graduates in industry.

James F. Donigan, formerly timekeeper for the Electric Steel Foundry Co., Portland, Ore., has been appointed assistant purchasing agent for the company.

Samuel Appelby, formerly with the W. G. Reichert Engineering Co., New York, has left that organization to establish his own business as a foundry consultant. Mr. Appelby plans to confine his consulting

activities to serving a small clientele of gray iron foundries producing medium and heavy castings as consultant or in an advisory capacity for short term periods only. Mr. Appelby has a background of 30 years with the foundry industry, 22 of them in supervisory capacities.

Amicus Most, who until recently was vice-president and general manager of the Parkway Foundry & Machine Co., Brooklyn, has joined the New Haven Clock and Watch Co., New Haven, Conn., as first vice-president and general manager.

S. F. Thune, formerly Pacific Coast Division sales manager, has been appointed sales manager of the Midwestern Division of National Starch Products, Inc., with headquarters in Chicago. Mr. Thune joined National in 1934 upon graduation with a degree in Chemical Engineering from the Worcester Polytechnic Institute. He will be succeeded as Pacific Coast sales manager by **Francis R. Loetterle,** a member of the company's Technical Service department.

Gustav Egloff, petroleum technologist and director of research for the Universal Oil Products Co., Chicago, has been elected president of the Western Society of Engineers, taking office June 6.

W. G. Twyman, production manager of the A. P. Green Fire Brick Co., Mexico, Mo., has been transferred to Detroit to become general manager of the A. P. Green Fire Brick Co. of Michigan. Holder of a degree in Ceramic Engineering from the Missouri School of Mines and Metallurgy, Mr. Twyman joined A. P. Green in 1936 and has served in various capacities in the Mexico plant and in sales work in Tulsa, Columbus and Indianapolis. In 1943, he became standards engineer for the company, and in 1947 was appointed production manager. Mr. Twyman will be succeeded by **W. F. Mundy,** Mexico, Mo., plant superintendent since 1947.

Hobart M. Kraner, research engineer for the Bethlehem Steel Corp., was recently installed as president of the American Ceramic Society at its 51st Annual Meeting in Cincinnati. A member of the A.F.S. Sand Division's Executive Committee, Mr. Kraner is the author of many technical papers on ceramics research and the holder of several patents in that field.

Changes recently announced by the Carborundum Co. in its district sales office personnel are: **R. P. Colosi,** presently office manager of the Buffalo District sales office, to be Cleveland District sales office manager, succeeding **H. P. Erbe,** who is now office manager at Pittsburgh. **H. E. Morrill,** supervisor of Branch Inventories, has been promoted to the position of office manager of the Chicago District sales office, succeeding **R. J. Nemec,** who has been appointed office manager of the St. Louis District sales office.

Martin J. O'Brien, Jr., assistant works manager for the Symington Gould Corp., Depew, N.Y., was recently appointed

(Continued on Page 82)

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Alan Goldblatt, Dir., Chicago Spectro Service Lab., Chicago.

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La Consolidada, S. A., Mexico, D. F., Mexico, (N. S. Covacevich, Manager).

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Ralph D. Buckley, Fdy. Fmn., Johnstone Foundries, Inc., Grove City, Pa.

George Johnstone, Sr., Fdy. Supt., Johnstone Fdries, Inc., Grove City, Pa.

Robert W. Jordan, Slsmn., Cooper Bessemer Corp., Grove City, Pa.

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E. Joe. Molinaro, Asst. Fmn., International Mall. Iron Co., Guelph, Ont., Canada.

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Donald E. MacBrien, Ind. Engr., Philadelphia Coke Co., Philadelphia.

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John Proctor, Sls. Repr., A. P. Green Fire Brick Co., Moline, Ill.

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George Harden, Sls. Repr., The Carborundum Co., Saginaw, Mich.

J. C. H. Stearns, Mgr., Ingot Sls. Magnesium Div., The Dow Chemical Co., Midland, Mich.

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Myer Shosid, Partner, Sherman Foundry Co., Sherman, Texas.

TOLEDO CHAPTER

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S. G. FitsPatrick, Met., Liberman & Gittlen Metal Co., Inc., Grand Rapids, Mich.

Rolfe Jenkins, Rec. Dir. & Ed. *Casting The News*, Campbell, Wyant & Cannon Fdy. Co., Muskegon Heights, Mich.

Emil M. Szten, Civil Engr., Campbell, Wyant & Cannon Fdy. Co., Muskegon Heights, Mich.

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Vincent R. Howard, Engr. Student, International Harvester, Waukesha, Wis.
Dan A. Lucas, Supt., Stainless Fdy. & Eng. Co., Milwaukee.
Lew F. Porter, Res. Met., University of Wisconsin, Madison, Wis.

STUDENT CHAPTERS

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

John R. Bedell · Charles C. Reynolds · John Wulff

MISSOURI SCHOOL OF MINES

George L. Knight, Jr.

OREGON STATE COLLEGE

Conrad Arnold Bergstrom · Merl E. Fishback
Herbert William Clifford · John L. Ward

OUTSIDE OF CHAPTER

Thomas R. Clark, Asst. to the Pres. Fdy. Oper., Omaha Steel Works., Omaha, Neb.
Richard Glencross, Met., Hersey Mfg. Co., Boston, Mass.
H. E. Handy, Met., Saco-Lowell Shops, Biddeford, Maine.

Australia

L. C. Elvage, Fdy. Supt., Chamberlain Indus. Pty. Ltd., Welshpool, W. Australia.

Belgium

Leon Duesberg, Admin. Fonderies H. Duesberg-Bosson Fils, Verviers, Belgium.
Robert Verstraeten, Mgr., S.A. Fonderies V. Verstraeten, Wetteren, Belgium.

England

Lloyds (Burton Ltd., Burton-on-Trent, England — (William Richard Cooper, Wks. Dir.)
Tower Foundry Ltd., Leicester, England.

France

Enrich Schmitt, Ing. Dipl. Brebach, Sarre, France.

India

Havanur Venkataramana Sastry, Instr., Madras Tech. Centre, Anantapur, India.
Gajanan Sadashiv Taskar, Dir. & Tech. Advisor, The Modern Fdy. & Mach. Wks., Ltd., Ahmednagar, India.

Italy

Ansaldo S. A. Direzione Centrale, Genova Cornigliano, Italy—(Mario Noris, Vice Direttore).

Norway

A/S Bremanger Kraftselskab, Strandgaten, Norway—(Dr. Ing. Fridtjof Andersen).

ENGINEERING EDUCATION

(Continued from Page 35)

established spray booths for under and first coatings of castings prior to machining. The economical extension of all these practices will be a big help in reaching for a greater market.

We have mentioned what will be one of the biggest factors—the placing of basic design data in the hands of present student engineers who are the customers of the future. With such aids and the increasing ability of the industry, through employment of engineers who can capitalize on present technology and add to it, foundries will secure a proper share of the metal goods market. These are reasons why all of us should be interested in engineering education.

Parents of 50 years ago usually thought of apprenticeship and plant training for their sons as a foundation for a good life. College was for the wealthy and the number of graduates rarely reached over 7,000 per year. During the intervening years increasing numbers of young men from the American middle income group and more lately from all groups, have attained a college education. Each foundryman must seek out these young men if he expects his company to remain competitive in the future. If he does not seek them he must look forward to continued and increased competition with them.

The task of getting into engineering step with our customers is not one that can be completed in a year or two. The chemical, petroleum, steel and other industries have gone through a similar process and each has spent 20 to 30 years in so doing. For our industry, with its more than 400,000 employees, an annual influx of about 1752 graduate engineers will be necessary to maintain it at a managerial staff strength of 60 per cent engineering graduates and 40 per cent from the ranks. The Foundry Educational Foundation believes that this is still 25 years hence but that the absorption will meanwhile increase in tempo from our modest beginning in 1947. If our industry maintains its present size as to personnel, in 25 years there should be 17,672 engineers out of the approximately 30,000 engineering, technical, sales and managerial persons in the industry.

In the present staff of the industry, there is an annual mortality of 10 per cent because of retirement, death, ill health, and shifting to other industries or occupations. For years to come the graduates from the Foundry Educational Foundation program will furnish only a meager supply of candidates for the positions opening through these natural causes. In spite of this, the Trustees of the Foundry Educational Foundation have wisely chosen to increase the number of graduates slowly, hoping to develop the educational production and industry absorption of less than one engineer per thousand employees 10 years from the start of the movement in the fall of 1947. It is hoped that a total of 300 per year can be reached. For this purpose schools will be added to the seven now participating and activity will be increased so that each will average 25 graduates annually. It is felt that from then on the rate will increase naturally and find its own balance in the economy of engineering industry.

Graduate Needs Foundry Interneship

An engineering graduate is equipped with certain basic information and methods. This knowledge is not of much value until training in present methods is added to his abilities and he has developed a sensitivity to the men with whom he will work and eventually help manage. It makes little difference whether the organization intends to apply his talents to supervision, sales, metallurgy or engineering, production planning and control, plant engineering, personnel work or cost control—the training is desirable. Variations in training may depend upon ultimate work.

This period is the student's transition from classes to industry, which he needs just as a doctor needs interneship before practicing his profession. The tolerance, fellowship and coaching which present supervisory, technical and managerial members of the industry can offer will pay off in a very few years.

Tablemates at Southern California Chapters' Ladies' Night, held May 21, were, left to right: Earle D. Shomaker, Kay-Brunner Steel Products Co.; Mrs. Shomaker; Henry W. Howell, Howell Foundry Co., Inc.; Mrs. Howell; Mr. and Mrs. Earl Van Atta; and Mr. and Mrs. Ray Hopping of Hopping's Foundry, Pasadena.

CHAPTER ACTIVITIES NEWS

Photographer Clyde R. Ethier of the Pendergast Sand Co., Milwaukee, snapped these foundrymen enjoying themselves at Wisconsin Chapter's Annual Outing, held July 15 at the Auzaukee Country Club, Milwaukee.

Western Michigan

Rolfe Jenkins
Campbell, Wyatt & Cannon Fdry. Co.
News Editor and Photographer

More than 800 people are expected to attend the Western Michigan Chapter's annual picnic at Pontaluna Golf Course near Muskegon, Mich., on August 20, according to Chairman C. H. Jacobson, Dake Engine Co., Grand Haven.

Donations have been made by 100 foundries and allied industries toward equipment, prizes, dinner and refreshments. Roy Herbst, West Michigan Steel Foundry Co., Muskegon, in charge of door prizes, was prepared to handle as large a crowd as any in the Western Michigan chapter's history this month.

The publicity committee has arranged for photographs in color, to be taken by members assigned to various strategic spots on the picnic grounds, and will show them to members at one of the early meetings this fall.

Chairman Jacobson has arranged for a professional group of entertainers to feature the evening hours of the picnic.

Committee members who have handled the majority of the work on the picnic, in addition to those already named, include Victor A.

Pyle, Pyle Pattern & Mfg. Co., Muskegon Heights; Vern Tietsort, Robert DeVore, Ross Shaffer and Webb Hallberg, all of Lakey Foundry and Machine Co., Muskegon; John Powers and Harold BeMent, both of Campbell, Wyant and Cannon Foundry Co., Muskegon; Clarence Fitz, Wolverine Brass Foundry Co., Grand Rapids; C. H. Lloyd, E. P. Houghton Co.; A. E. Jacobson, Grand Haven Brass; William Tuthill, American Seating Co.; Lauren P. Ramsey, Paul M. Wiener Foundry Co., Muskegon; and Max Borgeson, formerly of Lakey Foundry and Machine Co., Muskegon.

Central Illinois

V. W. Swango
Caterpillar Tractor Co.
Secretary-Treasurer

THE THIRD ANNUAL CLAMBAKE was held at the 40/8 Chateau near Pekin, Ill. on June 11. Approximately 275 foundrymen and their guests enjoyed the afternoon playing golf, watching an excellent exhibition of fly and bait casting by "Wally" Walz; a good Laborador retriever dog act by Clarence Steube as well as renewing old acquaintances and making new ones. At 5:30 p.m. the clam dinner was served and everyone had his fill of clams, chicken and all the trimmings. W. G. Schuller, Caterpillar Tractor Co., Peoria, was general chairman for the event.

Eastern New York Chapter

George Danner
American Locomotive Company
Publicity Chairman

A "PROBLEM CASTING CLINIC" was a feature of the last meeting of the season, held at Circle Inn, Lathams, on June 21st. Newly-elected chairman, Kenneth F. Echard of Eddy Valve Co., Waterford, presided.

This was not a "stump the ex-

Delighted grins on the part of members of the Central New York Chapter attest to the excellence of the clambake at the Chapter's Annual Outing held June 10 at Mountain Top Grove, Binghamton. Below—Outing sponsors were, seated left to right: George Ford, Fairbanks Co., Binghamton; Mrs. Louise Sacrey, Frank L. Phillips Co., Binghamton; and Alfred Hall, Hallstead Iron Foundry Co., Hallstead, Pa. Standing, left to right, Elmer Kime, Hallstead Iron Foundry Co., and Milton Steele, Sweets Foundry Co.

Some of the 275 foundrymen who attended Central Illinois Chapter's Annual Clambake near Pekin June 11.

Professor Howard F. Taylor (right), faculty advisor, presided at the May 11 meeting of the M.I.T. Student Chapter. At the speakers' Table were, left to right, Students Randall Cleworth, Kenneth McGrath, John Fries and Roland Ruetz, who spoke on their experiences working in foundries. This meeting was reported in the July Chapter Activities News.

perts" program, but a chance for all present to discuss their particular problem castings. All the speakers were leading foundrymen from our own chapter members.

The agenda covered both ferrous and non-ferrous castings. J. M. Jones, American Locomotive Co., presented a movie *"Making and Testing Gray Iron in the American Locomotive Co."* Some discussion followed on operating problems and metallurgical control.

G. E. Moore, Adirondack Foundries and Steel Co., gave a talk with slides on *"Foundry Procedure for Steel Castings Made for D-Day."* His company arranged a display of steel castings, which was the subject of much interest.

Jasper N. Wheeler of Wheeler Brothers Foundry, Troy, gave a short talk on non-ferrous casting difficulties with discussion from the floor. He was followed by Leo Scully, Scully Foundry, Coxsackie. Mr. Scully related some difficulties he had encountered in the non-ferrous casting field.

Out of town visitors at the meeting were a group of professors visiting Rensselaer Polytechnic Institute from other colleges—C. C. Sigerfoos, associate professor of Mechanical Engineering, Michigan State College and president of the Central Michigan Chapter of A.F.S.; Allison Butts, Professor of Metallurgy, Lehigh University, and Austen J. Smith, professor of Metallurgical Engineering, Michigan State College.

Northeastern Ohio

Sterling N. Farmer
Sand Products Corp.
Chapter Photographer

THE ANNUAL SUMMER OUTING, held Friday, June 24 at the Pine Ridge Country Club, Wickliffe, Ohio, featured all-day golf, swimming, a foundrymen vs. vendors baseball game, horseshoes, refreshments and a steak dinner. Door prizes and golf prizes were awarded. One of the most successful in Chapter history, the outing was planned by the Chapter's Entertainment Committee, headed by L. P. Robinson of the Werner G. Smith Co., Cleveland, with F. Ray Fleig, Smith Facing & Supply Co., Cleveland, in charge of ticket sales for the outing.

Chesapeake

Jack H. Schaum
National Bureau of Standards
Chapter Reporter

THE LAST MEETING of the year found the Chapter gathering in the Naval Gun Factory, Washington, D. C. The day was spent observing activities in the modern foundry and pattern shop. The group saw the 25-ton arc furnace tapped and a large number of steel castings poured. An interesting side trip was made to the shop, where latest-type anti-aircraft guns were being assembled and test-fired with compressed air. A dinner was held that

(Continued on Page 87)

Swimming and golf were just a few of the many activities offered at the Northeastern Ohio Chapter's

Annual Outing at Pine Ridge Country Club, June 24. (Photo courtesy Sterling Farmer, Sand Products Corp.)

NEW · · Foundry · Products

Readers interested in obtaining additional information on items described in New Foundry Products should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the item by means of the convenient code numbers.

Laboratory Sand Mixer

AG1—Table-mounted and hand-operated, Precision Scientific Co's laboratory mixer has a capacity of 10 quarts, depending upon consistency of materials to be mixed. Four quarts of core sand mixture can be prepared in a single batch. Measuring 12 in. in diameter by 5½ in. high, the mixer has a cast bronze spider attached to a central gear. Meshing with gear is a pinion mounted on an arm and which rotates when arm is turned. Paddle on end of pinion shaft turns on own axis as well as around the pan. At one end of arm is scraper which forces material from wall of mixer. Mixing unit can readily be removed from pan for cleaning, and top of mixer is open for inspecting and sampling materials. All parts in contact with materials are of stainless steel.

Ferrous Castings Electrode

AG2—Eutectic Welding Alloys Corp.'s large diameter electrode, with Frigidare coating, is designed for welding of heavy iron castings, and is particularly adaptable for overlaying and repairing large turbines, pumps, cylinder heads, housings, and other large ferrous castings. Eutectrode 24/49 is available in 1/4, 3/16, 5/32, 1/8 and 3/32 in. sizes for all types of cold cast iron welding, requiring no preheating or dismantling of equipment. For use with either a-c or d-c machines, Eutectrode 24-49 has a uniform burn-off rate, flows out rapidly and produces welds with tensile strength of 50,000 psi and Brinell 150-200. Literature available.

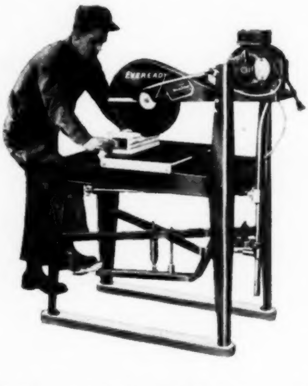
Coated Fabric Gloves

AG3—A coated fabric work glove, claimed by its manufacturer, the Surety Rubber Co., to be more resistant to chemicals and

abrasion than rubber or standard synthetic work gloves, is coated with Sure-seal PK, a chemical adaptation of synthetic rubber. In addition to its resistance properties, this glove is thick and pliable, providing adequate cushioning for all types of heavy work. Available in knit-wrist, band-top 12 and 14 in. gauntlets.

Masonry Saw

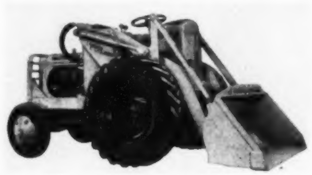
AG4—A masonry saw developed by the Everready Briksaw Co. can be used for both wet and dry cutting, is instantly portable and cutting head can be adjusted in four seconds for such widely different size materials as quarry tile, brick, partition tile and concrete block. Patented control enables operator to reset cutting



head at any desired angle by means of tilting foot treadle. Cutting speeds claimed by manufacturer are: firebrick, 4 seconds; concrete block, 19 seconds; face brick, 8 seconds, glazed tile, 21 seconds; glass block, 8 seconds, vitrified pipe, 18 seconds, vitreous brick tile, 21 seconds. Other features include one-piece cutting head which can be removed from saw frame in 21 seconds, and an automatic blade pressure spring adjustable to hardness or softness of material being cut.

Materials Handling Loader

AG5—Tractomotive Corp.'s materials handling loader is mounted on rubber tires and has a ½ cu yd standard bucket mounted over the driving wheels, with steering wheels in the rear—an arrangement designed to make steering easier, especially where the going is soft. The TL-W Tractor Loader has short overall length, 12 in. with bucket down, and narrow width, 5 ft, 9 in., enabling it to be used in limited-space working areas. Other



features are: automatic tilt-back, hydraulic operation one-piece, seamless steel tubings and hydraulic hose lines with detachable and re-usable fittings. Close quarter operation is possible because bucket is eased into material and picks up load through forward crowding action, speeding up loading and holding spillage to a minimum.

Large Carbon Bricks

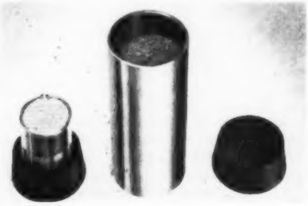
AG6—A new, larger size carbon brick is announced by National Carbon Co., Inc. Made in the large size of 13½ x 6 x 3 in., these bricks are quicker to lay up, have fewer joints to cement, and make a sounder job. Being from 20 to 45 per cent lighter than ceramics, these carbon bricks weigh only 14.4 lb. Carbon has no melting point and retains its strength at metal working temperatures. It is highly resistant to slag attack and immune to thermal shock. Other new sizes of carbon brick also available are: a key brick measuring 13½ x (6-5) x 3 in., weighing 13.2 lb.; a 9 x 6 x 3 straight brick, weighing 9.5 lb.; and a 9 x (6-5¼) x 3 in. key brick, weighing 9.1 lb.

Machine-Cast Bar Solders

AG7—Castomatic, a new type tin-lead bar solder developed by the Federated Metals Division, American Smelting & Refining Co., is now manufactured by a die-casting process which eliminates oxides in the metal and provides uniformity of composition. Chemical tests have shown that segregation of solder elements, not uncommon in hand cast bars, is virtually eliminated. Precisely controlled cooling conditions in the Castomatic system result in unusually fine grain structure and lack of voids in bars. Bar solders of all commercial grades are now being produced in standard 1½ lb size, and ½ and 1 lb bars will be available in the future.

Permeability Tube

AG8—Harry W. Dietert Co.'s No. 352 Master Permeability Tube is designed to provide a quick, simple check test for permeability of foundry sands. The tube contains an actual permanent sand standard, which may be used with orifice or stopwatch if desired Check reading can



be taken as rapidly as with a routine sample. Four ranges—25, 50, 100 and 150 permeability are available. Self-contained dessicator assures calibration remaining constant indefinitely.

Metal Primer

AG9—Ospho, a metal primer developed by Rusticide Products Co., is applied directly over rusted surfaces, causing rust to change chemically into iron phosphate, an inert, hard, dark gray substance. After drying overnight, oxidation stops and paint adheres so tightly that moisture and oxygen cannot attack the metal. Water-thin and covering a larger area than paint, Ospho is inexpensive and easily applied, is equally effective for exterior and interior work alike, and cuts preparation time because rust does not require removal. Manufacturer claims paint jobs will last twice as long with Ospho.

Indicating Pyrometer

AG10—Assembly Products, Inc.'s Simplytrol Indicating Pyrometer is designed for measuring temperature in ceramic kilns, furnaces and ovens, or in various types of baths, and is offered in several ranges for heat up to 2500 F and 1370 C. Unit will accommodate leads up to 100 ft long. Alnico V magnets with sintered iron poles provide extra flux for high torque movement. Moving elements ride on polished pivots in sapphire jewels and have phosphor bronze hairsprings. Instruments are accurately balanced and may be used in any position.

Electric Fork Truck

AG11—Maximum lift of 120 in. is achieved by the Crescent Aisle Saver Electric Fork Truck, with free initial lift of 63½ in. Truck is equipped with 83-in. collapsible mast incorporating twin-cylinder hydraulic lifting unit. Collapsed 83-in. overall height permits truck to operate in low-ceiling areas. Standard tilt is 5 degrees back and 3 degrees forward. Good visibility is provided at every stage of lift. Controls are within easy reach of operator and ready access to all mechanisms simplifies inspection and maintenance. Aisle-Saver Model JHVH-2H is especially designed for operation in warehouses and plants with narrow aisles and will right-angle stack from 8-ft. aisles with 40" x 32" pallet.

Portable Hardness Tester

AG12—A portable hardness tester for Rockwell readings, developed by the Riehle Testing Machine Division of American Machine and Metals, Inc., weighs only 3 lb, 6 oz and comes in a convenient carrying case. Tester kit includes such accessories as test blocks, flat anvil, "V" anvil, convex anvil, diamond and ball indentors. Comparable in accuracy to bench type testers, this instrument costs only half as much, manufacturer claims.

Automatic Sprinkler Extinguisher

AG13—An economical automatic sprinkler fire extinguisher, developed by Stop Fire, Inc., utilizes C.B.M. Chlorobromomethane) and requires no piping or expensive installation. Flame does not have to touch unit. When fire occurs, heat waves cause sprinkler unit to discharge a wide, fast-moving spray of combined carbon dioxide and atomized chlorobromomethane, which blankets and snuffs

fire. Equally efficient on oil, grease, flammable liquids, lacquer, paint, solvent or electrical fires, Stop-Fire is non-freezing and has extinguished lacquer fires in as little as one-half second.

Car Shaker

AG14—Allis-Chalmers Mfg. Co.'s newly developed Car Shaker unit, when attached to drop-bottom gondola cars, speeds up unloading of granular materials by vibration. Handled by a hoist or crane, the Car Shaker is placed on the top flanges of the car, with five feet of contact on each side. Totally-enclosed 15 hp motor drives eccentric shaft at 1,000 rpm, vibrating car and causing granular material to loosen for fast unloading.

Materials Lifter

AG15—Pucel Enterprises, Inc.'s non-slipping, multi-purpose Grizzly Lifter is designed to handle bulky and awkward materials and equipment, eliminating use of chains, ropes, slings, pinch bars and C clamps. Features include lifter bar calibrated in inches and available in various lengths, easily readable calibrations, non-slipping lifter bar, swivel joint locking handles requiring no tools for handling, and reversible jaws permitting inside or outside clamping and usable as jacks, jigs or fixtures. Lifter, with its interchangeable attachments, will meet specific job needs for lifting, lowering, leveling or transporting.

Tension Testing Scale

AG16—The Pelouze "Push or Pull" tension testing scale can be inserted into the smallest of openings without removing the installed units or parts, for instant, accurate measuring of tension in pounds and ounces. Rods are 6 in. long, threaded and detachable. Precision calibrated spring and adjustable head permit use in any position. Easily read, calibrations insure positive readings at a glance. Tension testing scales are available in three sizes—Model 2-T capacity 2 lb graduated by ¼ oz; Model 5-T, capacity 5 lb, graduated by 1 oz; and Model 20-T, capacity 20 lb, graduated by 4 oz.

Chipping Tool

AG17—Re-Bit, a weld chipping hammer developed by the Atlas Welding Accessories Co., has a simple taper that locks bits securely in the head at any position desired, making it easy and practicable to replace worn bits. No balls, springs, screws or clamps are needed. Blades are redesigned to provide better visibility, longer life, easier access to tight spots and a wider chipping edge. Re-Bit Tomahawks are offered in 12 and 16 weights with choice of Flex-O-Wood or steel handle.

Air Driven Belt Sander

AG18—An air driven belt sander, adaptable for metal work on all types of surfaces, whether concave or convex, has been

developed by Buckeye Tools Corp. The sander is applicable to all types of metal finishes, both sheet metal and solid castings, and to all types of materials in iron,

(Continued on Page 91)

FOUNDRY Literature

Readers interested in obtaining additional information on items described in Foundry Literature should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the items by means of the convenient code numbers.

Steel Castings

AG101—The uses of steel castings in industry are emphasized in an illustrated 35-page brochure published by the Steel Founders Society of America. The booklet directs particular attention to the versatility, strength and dependability of steel castings, citing such advantages as streamlining, weight saving, greater rigidity, strength and eye-appeal. Included in the brochure is a brief history of the steel casting industry, statistics on today's industry and market, descriptions of castings used to solve specific industrial problems, and a detailed report on SFSA's cooperative research program. An envelope folder, incorporating a tabulation of general engineering types of steel castings, is enclosed.

Welding Ferrous Castings

AG102—An eight-page reprint, *"Repairing Gray Iron Castings by Welding,"* originally appearing in *Iron Age*, is available gratis from the Air Reduction Sales Co. The reprint, illustrated with 10 sketches and photographs, shows case histories of the repair and maintenance by welding of cast parts and contrasts three of the most common welding processes—oxyacetylene, electric arc and carbon arc—as applied to a forging hammer anvil and various other cast parts of industrial machines and equipment.

Forehearth Furnaces

AG103—A four-page illustrated folder recently issued by the Pittsburgh Lectromelt Furnace Corp. describes the Moore Rapid Lectromelt Forehearth Furnace, an especially designed direct-arc furnace for operation in conjunction with existing cupolas or air furnaces to facilitate the control of temperature and quality of the metal being melted. Listed are such advantages as close temperature control, control of analysis by additions or refining operations or both, the providing of reservoir or holding capacity for leveling off peak demands from the pouring floor and the providing of more uniform analysis by proper mixing.

Materials Handling

AG104—*"Job Study No. 10—An Authorized Foundry Job Analysis"* is a four-page illustrated folder describing the progressive development of a materials handling system at the Chicago Hardware Foundry Co. by the Frank G. Hough Co. Presented are the problems encountered in this foundry, such as sand handling and conditioning, slag removal, scrap core removal and sprue reclamation, and the Hough Co.'s solution of these problems by the use of six Payloaders and a Payloader Buggy. The functions of these machines are fully described in the folder.

Magnetic Separators

AG105—A 12-page, two-color catalog published by the Eriez Mfg. Co. describes the company's complete line of permanent, non-electric magnetic separators and electronic metal detectors. Complete specifications regarding weights, sizes and strength comparisons for various chute and spout magnets are given, as well as tables of operating capacities for permanent magnetic pulleys, drums, pneumatic line assemblies, pipeline traps, ferrous filters, floor sweepers and pipe rolls. Also discussed are factory engineering and laboratory services offered by Eriez.

Conveyor Line

AG106—A four-page, two-color bulletin describing its power belt conveyor line is available from the Rapids-Standard Co., Inc. Challenger and Defender models are listed in the bulletin, with construction features listed separately. The bulletin is sectionalized to provide related grouping of outstanding features in a single panel for ease of reading. Features presented in detail are the nosed-over delivery, power-driven feeder section, hydraulic telescoping center lift, simple screw pitch control and sub-bases. A specifications page outlines controls, bed construction, available guard rails, casters and motors.

Sandblaster's Helmet

AG107—A two-page bulletin issued by the W. W. Sly Mfg. Co. describes the Purair Helmet for the protection of sandblast operators against the inhalation of dust, as well as for protection against rebounding abrasive. Features of the helmet, as described in the bulletin, are lightness, comfort, wide range of vision, and freedom of head movement. All metal parts are of aluminum, with one-piece hood made of rubber. Bulletin includes specifications, applications and instructions for use of helmet.

Molding Machines

AG108—Tabor Mfg. Co.'s illustrated brochure describes the company's complete line of foundry molding and cutoff machines. Listed are specifications and applications for flask-lift machines (plain jar, portable jar, power squeeze, jar squeeze, split-pattern, and jar squeeze drop-plate) vibrators, plain and shockless jarring machines; jar, rollover and pattern draw machines; and cope and drag machines.

Box and Muffle Furnaces

AG109—Five models of Burrell box and muffle furnaces for analysis, control and production in metallurgy, manufacturing and chemistry are described in Burrell Technical Supply Co.'s Bulletins 315 and 515. These furnaces are adaptable to both low and high temperature operations—performing routine functions such as ashing, drawing, igniting and tempering at low temperatures from 600 to 2000 F—and sintering, melting, clinkering and high-speed hardening at high temperatures above 2000 F. Furnaces are entirely self-contained and compactly built.

Floor Loading Capacities

AG110—Means of determining whether floors, particularly secondary floors, will support industrial power trucks is given in Yale & Towne's recently-published report on the use of power trucks in industry. Data given provide a quick method of approximating safe floor capacities and help the engineer choose equipment in permissible weight ranges.

Indicating Pyrometer Controller

AG111—Wheelco Instruments Co.'s Bulletin MC-1 describes the Multi-Switch Capacitrol, an indicating pyrometer controller. Such information as suggested applications, measuring and indicating features, control functions, method of applying electronic principles, and ranges and technical data are covered in this release. Complete specifications and prices are furnished for both Direct Deflection and Resistance Thermometer models.

Refractory Mixtures

AG112—Quigley Co., Inc., announces the publication of Bulletins HC-103T (Hearth-Crete), KY2730 (Kyram) and CX201c

(Chromix) describing three new refractory materials for foundry use. Kyram is a dry air-setting refractory ramming mixture of Kyanite and calcined clays mixed with a new ceramic binder to produce full bonding strength from room temperature to maximum service temperatures, and requires only mixing with water. Hearth-Crete is a chrome magnesite castable refractory that is mixed on the job like concrete, requires no ramming and sets quickly at room temperatures and can be put under heat in approximately 24 hours. Chromix is a chrome base plastic ramming material adapted for construction of monolithic furnace hearths and studded tube water walls. Chemical components, applications and advantages of each mixture are given.

Fork Truck Catalog

AG113—A catalog covering its entire line, issued by the Automatic Transportation Co., describes the Automatic, Skylift and Transporter lines. Photographs of all models are shown, and physical characteristics and performance figures are shown in the catalog.

Moisture Tester

AG114—Alpha-Lux Co.'s new bulletin AI 34 describes in detail the Speedy Moisture Tester for testing sands, ganister, clays, oxides, refractory grogs and abrasives. Types, advantages, applications, and operation of the moisture tester are given in this four-page bulletin.

Crucibles and Refractories

AG115—Crucibles of all types, graphite base blocks, melting bowls, retorts, stirrers and skimmers, stoppers and nozzles are described in the Joseph Dixon Crucible Co.'s 28-page illustrated catalog. Dimensions, capacities, handling suggestions and applications are given for the products listed.

Magnesia Insulation

AG116—A 96-page manual on 85 per cent magnesia insulation, illustrated with drawings and photographs, will shortly be available to those having a direct interest in industrial heat insulation. Subjects covered are: properties, determination of correct thicknesses, application and finishing procedures, and insulation maintenance. The appendix contains a discussion of practical applications of heat transmission theory, definitions of technical terms, 15 tables of data on 85 per cent magnesia and related subjects, a glossary of trade terms, and a list of trade names of the insulating materials and accessory products. Request for copy must be made on business letterhead. Copies will be numbered and numbers registered with the Magnesia Association.

Foundry Practice

AG117—Foundry Services, Inc.'s house organ, *FOSECO Foundry Practice*, which contains pertinent information and technical articles on the foundry industry, is now available without cost to readers of AMERICAN FOUNDRYMAN who desire their names placed upon its mailing list.

FOUNDRY FIRM *Facts*

Vanadium Corp. of America announces that its Aluminum Alloy Division at Chester, Pa., is now in full production, producing vanadium-aluminum alloys, titanium aluminum alloys and silicon-aluminum alloys for the aluminum industry, and aluminum (deoxidizing grades), ingots, notch bars, shot, grain and special shapes for the steel industry. A spectrographic laboratory and new and original furnace equipment have been added to the Division's facilities to insure uniformity, cleanliness and metallurgical product control.

Semet-Solvay Co., Ltd., Toronto, Ont., announces the removal of its offices from 69 Yonge St. to Room 1317, Canadian Bank of Commerce Bldg., 25 King St. West, Toronto.

American Brake Shoe Co., New York, announces that it has contracted to purchase a former war plant at 344 Vulcan St., Tonawanda, N. Y., from the War Assets Administration. The 150,000 sq ft plant will be operated by Brake Shoe's Ramapo Ajax Division, which will transfer certain of its switch, railroad frog and special trackwork manufacturing operations from its Hillburn and Niagara Falls, N. Y., plants to the new plant. The plant was originally constructed for the Navy in 1942 at a cost of $1,500,000 and was operated by the Farrel-Birmingham Co. during World War II.

American Brake Shoe Co.'s Atlanta, Ga., Foundry of its Southern Wheel Division was closed July 31 because of a lack of orders for chilled tread freight car wheels. Many of the plant's 57 employees will be transferred to other Brake Shoe plants, and plant property and equipment will be sold. Customers will be served from other Brake Shoe plants throughout the country. The Atlanta plant has been in continuous operation for 36 years.

The Whiting, Ind., Plant of **Federated Metals Division, American Smelting & Refining Co.** was host on June 17 to a group of 41 students from the Case Institute of Technology, Cleveland, as part of the Institute's annual Junior Metallurgical Inspection Trip. Particular attention was given to the alloying of various brass and bronze ingot metals, and to the many different types of furnaces in operation. Also on the schedule was an explanation of the careful segregation and classification afforded non-ferrous metals entering the plant as scrap. The tour was conducted by J. F. McQuillan, plant superintendent. Gerald M. Cover, assistant professor, and F. J. Miller, instructor, were in charge of the student group.

American Marine Brass Foundry, Inc., 22 Berriman St., Brooklyn 8, announces that its name has been changed to **American Art Foundry, Inc.**, to be more in keeping with its specialty—ornamental casting. There will be no change in personnel or company address.

C. O. Bartlett & Snow Co., Cleveland, announces the appointment of **R. K. Price & Associates, Inc.**, 70 Pine St., New York, as its export sales representative for its line of foundry equipment.

Western Foundry Co., Tyler, Texas, announces the construction of a new 30,000 sq ft plant for the production of cast iron soil pipe and fittings—an entirely new line of manufacture for the company, which makes stove castings, and parts for agricultural equipment.

Aerial view of the Pacific States Cast Iron Pipe Co.'s $3,500,000 cast iron pipe plant, constructed at Provo, Utah, during this past winter.

Claimed to be the most modern centrifugal cast iron pipe plant of its kind in the world, is **Pacific States Cast Iron Pipe Co.'s** $3,500,000 plant at Provo, Utah, the only such plant west of the Mississippi. Consisting of four mill-type structural steel frame buildings, the new foundry has a capacity of 100,000 tons a year, and utilizes the super deLevaud process—casting of pipe in a revolving, water-cooled metal mold where pouring ladle and mold are stationary.

Raw material is brought to covered storage on a railroad spur. Special bridge cranes handle material into two 96 in. bore cupolas, each capable of melting 25 tons of iron per hour. Bridge cranes convey hot metal from cupolas to casting machines and hot pipe from casting machines to annealing furnace.

An extensive shop has been provided for refinishing steel molds used in the casting process. The only sand used in casting is in the core forming the bell end of the pipe.

Pipe is continuously heat treated in the annealing furnace, then rolls by gravity on skid rails through various finishing processes. Special equipment dips pipe in tar vat prior to shipment. All pipe is hydraulically tested under 500 lb pressure.

Additional facilities are being provided for installation of the McWane Cast Iron Pipe Co.'s (the parent company) precaulked lead joint and for lining pipe with a thin coat of cement when needed.

Preliminary equipment layouts and design were prepared by W. Lee Roueche, manager of Plant Development for McWane. F. H. McGraw & Co. designed and engineered the structure.

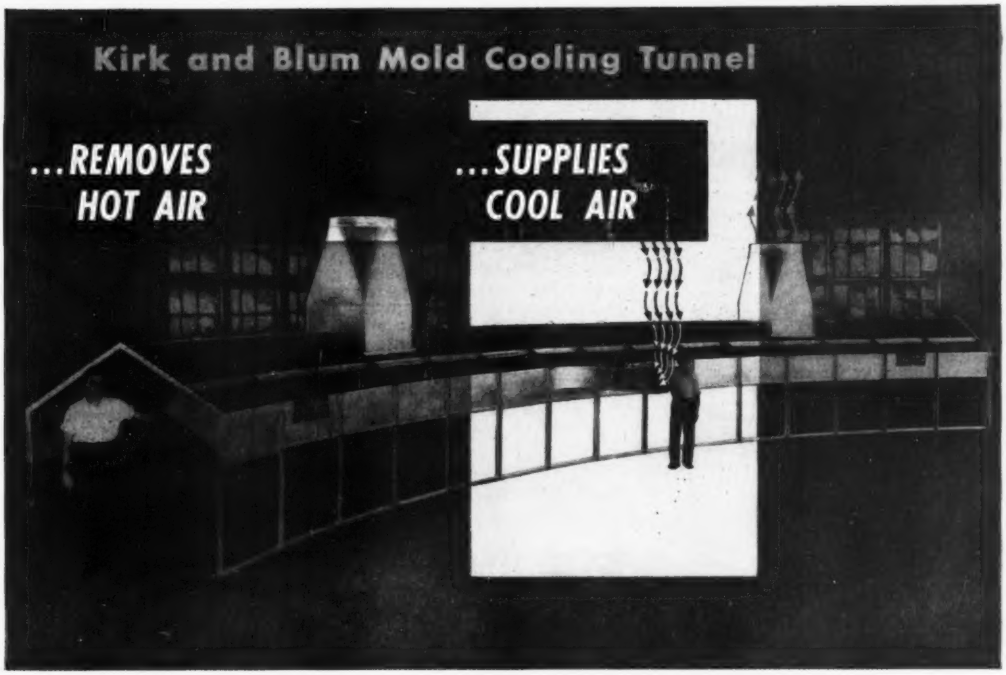
Unitcast Corp.'s Plant No. 1 at Toledo, Ohio, recently suffered a $50,000 fire, which damaged its heat treating, layout and inspection departments. The plant's output was transferred to Plant No. 3, Toledo, during repairs.

Minnesota Foundry Co., Inc., is the new name of the **Luverne Brass & Aluminum Co.**, Luverne, Minn. The firm was recently purchased by a group headed by Lynn Hill, Sioux Falls Machine Works, Sioux Falls, Ia.

Harnischfeger Corp., Milwaukee, recently completed construction of a modern warehouse and office building at Huyler and North Sts., Teterboro, N. J. The new building has over 14,000 sq ft of floor space.

Three of the foundry plants of the **Blaw-Knox Co.**—the **Lewis Foundry &**

(Continued on Page 90)



SOLUTION to the problem of efficiently cooling castings and at the same time, removing hot air, is illustrated here in the plant of National Malleable & Steel Castings Co., Indianapolis, Ind. The "quarter-circle" of hood is supplied with a built-in duct which supplies cool air all along the mold cooling conveyor. This air, drawn from outside the foundry, picks up heat from the castings and is then exhausted outside the building. The hood is supported on just one side so there is minimum interference with trucks on the "aisle side" and cleaning is made easier.

Engineering ingenuity such as this is just one reason why plants . . . large and small . . . in every industry depend on KIRK & BLUM for efficient cooling and dust and fume collection. The 40-year store of experience behind KIRK & BLUM engineering, fabricating and installation service is yours to command; refer your air-handling problems to KIRK & BLUM.

Designed, Fabricated and Installed by Liberty Engineering, Div. Kirk & Blum, Indianapolis, Ind.

FOR CLEAN AIR . . . THE [illegible] TOOL

KIRK AND BLUM

DUST AND FUME CONTROL SYSTEMS

THE KIRK AND BLUM MANUFACTURING COMPANY

2876 Spring Grove Ave. • Cincinnati 25, Ohio

PERSONALITIES

(Continued from Page 69)

works manager. Mr. O'Brien is the immediate past chairman of the A.F.S. Western New York Chapter.

The British Institute of Metals has appointed two honorary corresponding members in the United States. They are **Dr. R. A. Wilkins,** vice president in charge of Research and Development for Revere Copper & Brass, Inc., Rome, N. Y.; and **Prof. R. F. Mehl,** director of the Metals Research Laboratory and head of the Department of Metallurgical Engineering, Carnegie Institute of Technology.

Roger W. Batchelder has been appointed vice-president in charge of sales of the National Bearing Division of the American Brake Shoe Co. Mr. Batchelder, who will continue to be located at Division headquarters in St. Louis, was formerly assistant to the president of National Bearing and has been with the Division since 1933. During World War II, he served as a Colonel with the Army Air Forces, returning to National Bearing following the war as general purchasing agent for the Division.

Allan Wigle succeeds **Charles Dosenbach** as general plant manager of L. A. Cohn & Bro., Inc., Chicago, following Mr. Dosenbach's recent resignation. Holder of a degree in Metallurgical Engineering from the University of Toronto in 1926, Mr. Wigle has for many years been active in the supervision of non-ferrous metal and alloy production for the company.

The Carborundum Co., Niagara Falls, N. Y. announces the election of **General Brehon B. Somervell,** president of Koppers Co., Inc., Pittsburgh, to its Board of Directors. General Somervell served as Chief of Supply (G-1) of the Army during World War II.

George S. Grassmyer has been appointed manager of inspection for the Eddystone, Pa., Division of the Baldwin Locomotive Works, Philadelphia. He has been with Baldwin since 1941.

E. D. Bransome, president of the Vanadium Corp. of America, was recently appointed chairman of the Board and president of Mack Trucks, Inc., New York. Mr. Bransome has resigned as president of the Vanadium Corp. of America, but will serve that organization as chairman of the board and a member of its executive committee.

Charles Pingry of the Chain Belt Co. has been named district engineer at the company's Dallas, Texas, office.

H. G. Wild has been appointed by the Porter-Cable Machine Co. to manage its Eastern Zone. Mr. Wild was formerly central New York district sales representative for the company.

Harry R. Reynolds and **Howell L. Potter,** have been appointed consulting engineer and chief engineer, respectively,

for the Fafnir Bearing Co., New Britain, Conn. Mr. Reynolds was formerly chief engineer and Mr. Potter assistant chief engineer of the company.

Mt. Pleasant Pattern & Casting Co., Mt. Pleasant, Pa., a new firm producing nonferrous castings, patterns and matchplates, is headed by **H. Wilmoth**, formerly plant superintendent for Pan American Alloys Inc., Scottdale, Pa., president; **I. C. Davis** of the Scottdale Pattern Shop, Scottdale, Pa., treasurer; **C. A. Bodle**, vice-president; and **C. E. Weinkauf**, sales manager.

George W. Altman, formerly general manager of Bridgman Castings, Inc., Bridgman, Mich., has been appointed foundry engineer for the National Radiator Co., Johnstown, Pa. Mr. Altman will work on metallurgical and engineering projects at National Radiator's New Castle, Pa., and Trenton, N. J., plants, but will make his headquarters at the Johnstown plant. During the war, Mr. Altman operated foundries in England and Germany for the Army Engineers.

C. G. Eickmeyer, formerly with Sorbo Mat Process Engineers, St. Louis, has been appointed manager of the Foundry division of the Hansell-Elcock Co., Chicago. Following graduation from the Hadley Trade School and Washington University, Mr. Eickmeyer was with the Duncan Foundry & Machine Works, Inc., Alton, Ill., prior to joining Sorbo-Mat.

Dr. James R. Dudley has been appointed supervisor of new product development, and **John D. McPherson**, supervisor of market research, for the American Cyanamid Co. Dr. Dudley has been with American Cyanamid since 1940, when he became a research chemist in the company's Stamford, Conn., laboratories, and upon assuming his new position was in charge of research on polymers and resins. Mr. McPherson joined American Cyanamid's Technical Division upon his release from the Army, where he served with the Chemical Warfare Service.

Effective July 1, three members of the **Norton Co.'s** sales force had their territorial assignments changed. Henry A. Blessing, formerly Chicago field engineer, has been appointed Chicago field engineer. David H. Paul of the Worcester, Mass., sales engineering department has been named abrasive engineer in charge of a new territory with headquarters in Memphis, and Myles A. Snyder, also of the Worcester sales engineering department, has been appointed Chicago field engineer.

William L. Garner is now service engineer with Pittsburgh Metals Purifying Co., Pittsburgh. He was formerly in the foundry of Pratt & Letchworth Co., Buffalo, N. Y.

Manley E. Brooks, until recently foundry engineer for Magnesium Alloy Products Co., Compton, Calif., has returned to the Dowmetal Foundry, Dow Chemical Co., Bay City, Mich., as technical salesman. Mr. Brooks has written a number of technical papers published by A.F.S., has served on a number of Society committees and is a former vice-chairman of the Aluminum & Magnesium Division.

Sylvester E. Mueller has joined Continental Foundry & Machine Co., East Chicago, Ind., leaving Falk Corp., Milwaukee, where he was foundry research engineer. A graduate of Marquette University, Milwaukee, he worked for Falk, Sivyer Steel Foundry Co. and Milwaukee Steel (Grede Foundries) as a cooperative student while going to school. Mr. Mueller was a director of the A.F.S. Wisconsin Chapter and is a member of the Green Sand Properties Committee.

C. E. Weir, has been appointed manager of the Edwardsville, Ill., Plant of the United States Radiator Corp., succeeding **G. F. Naumann**, who recently retired because of ill health. Mr. Weir, who at the time of his appointment was assistant manager of the company's Geneva, N. Y., Plant, has been with the United States Radiator Corp. since his graduation from Ohio State University in 1916.

Arthur H. Bunker, a general partner in the firm of Lehman Brothers, was elected president of the Climax Molybdenum Co. at a meeting of the Board of Directors and took office on July 1. Mr. Bunker who before the war was executive vice-president of the Lehman Corporation,

was the founder and first president of the United States Vanadium Corp., which became a part of Union Carbide and Carbon Corp. in 1927. He was also active in the founding of the Potash Corp. of America. Mr. Bunker's business career has included the presidency of Carib Syndicate, Ltd., and the Colon Oil Corp. He has also been a director of Anglo-Huronian, Ltd. He is at present a director of the American Metal Co., Ltd., the Firth Steel & Carbide Corp., and the Climax Molybdenum Co. During the war, Mr. Bunker served as vice-chairman of the War Production Board's Metals and Minerals Office, and was later appointed deputy executive vice-chairman and finally chief of staff of the War Production Board.

William Van C. Brandt, for many years connected with the Electric Storage Battery Co., Philadelphia, was recently elected managing director and secretary-treasurer of the Electric Industrial Association, and will make his headquarters in the Association's new offices at 3701 North Broad St., Philadelphia.

David Edelstein has been appointed scrap purchasing agent for the Eastern territory of Federated Metals Division, American Smelting & Refining Co. An engineering graduate of the City College of New York, Mr. Edelstein joined Federated in 1928, while taking graduate courses in metallurgy at Columbia University. In 1936 he was appointed assistant superintendent of the company's Perth Amboy, N. J., plant, and later placed in charge of scrap materials at that plant. Mr. Edelstein's offices will be located at 120 Broadway, New York.

R. G. Caulley, formerly general sales manager, has been named vice-president in charge of sales for the Peninsular Grinding Wheel Co., Detroit. Mr. Caulley was formerly associated with the Republic Steel Corp. and Fruehauf Trailer Co.

Newly-elected officers of the Worthington Pump & Machinery Corp who took office July 1 are: **Hobart C. Ramsey,** president, succeeding **Clarence E. Searle,** who has been elected vice-chairman of the Board of Directors; **Edwin J. Schwanhausser,** executive vice-president; and **John J. Summersby,** vice-president in charge of sales. Mr. Ramsey, who was formerly executive vice-president, has been with the company since 1920. Mr. Searle has been with the company since 1932, and has been president since 1945.

Marshall A. Shapiro of the California Metals Co., Oakland, was recently appointed to the National Affairs Committee of the Institute of Scrap Iron & Steel, Inc.

W. R. Patterson, chief plant metallurgist for the Torrance, Calif., plant of the National Supply Co., has been appointed general superintendent of the plant's steel department and will continue in his capacity as plant metallurgist.

Industrial Sales & Engineering Co., Memphis, headed by **C. W. Dean,** has been appointed Memphis district sales representative for American Air Filter Co. dust control equipment.

Dr. Robert F. Mehl, director of the Metals Research Laboratory and head of the Metallurgical Engineering department of the Carnegie Institute of Technology, is flying to Brazil, where he will be an honored guest at Sao Paulo Research Institute's 50th anniversary ceremonies.

P. B. Lowery succeeds the late **Zar T. Crittenden** as chief metallurgist of the Pontiac Motor Division of General Motors Corp. Mr. Lowery, who has been with Pontiac since 1922, will be assisted by **A. H. Robinson.**

J. M. Davies has been named director of research for the Caterpillar Tractor Co., Peoria, Ill., succeeding **C. G. A. Rosen,** who is recovering from an illness and will act as an advisor to the company in the development of diesel engine design. Mr. Davies, who was formerly associate director of research, will be succeeded by **Dr. L. A. Blanc,** who has been assistant director of research in charge of the Physical, Chemical and Metallurgical Division of Caterpillar.

Henry V. Bootes was recently elected vice-president in the sales department of the American Car & Foundry Co., New York. Prior to joining American Car & Foundry in 1947, Mr. Bootes was district manager of the Ohio Injector Co., and

since 1948 was assistant vice-president of the sales department for AC & F.

James F. Clark was recently elected treasurer of the American Car & Foundry Co., New York, succeeding **Lester A. Blackford,** who is retiring after 44 years' service with the company.

Jack M. Lutz was recently appointed assistant to the president of the Continental Foundry & Machine Co., East Chicago, Ind.

Frank A. Crossley, instructor in the Illinois Institute of Technology's Department of Metallurgical Engineering, has been chosen to direct courses in foundry practice and engineering, which will be part of the engineering curriculum to be established at Tennessee Agricultural and Industrial State College, Nashville. Mr. Crossley received his B.S in Engineering from Illinois Tech as part of the Navy's V-12 program in 1945, and is now working toward his master's degree in Metallurgical Engineering while instructing there.

R. O. Anderson has been selected to head the Norton Co's newly-established St. Louis district, which will be composed of areas formerly in the company's Rocky Mountain, South Central and Chicago districts. Simultaneously, it was announced that **H. G. Brustlin** has been appointed abrasive engineer in the Denver territory.

N. S. C. Walsh, president of the Walsh Refractories Corp., St. Louis, has been elected chairman of the company's Board of Directors. He will be succeeded as president by **James L. Crawford,** formerly vice-president and general manager. Mr. Crawford joined Walsh in 1932 as general manager and was later elected a vice-president and a member of the Board.

John E. Carroll, a partner in the firm of Harron, Rickard & McCone, Los Angeles, has been appointed general sales manager for the American Hoist & Derrick Co., St. Paul. Mr. Carroll was formerly Chicago, Texas and West Coast district sales representative for American Hoist & Derrick Co., but resigned to become a partner and head of Harron, Rickard & McCone's Construction Equipment Division.

A. W. Anderson, vice-president of the Claud S. Gordon Co., Chicago., recently resigned after 31 years service to the company because of illness.

John Mulholland succeeds **Fred Carl** as metallurgist for the Central Foundry Division of General Motors Corp., Danville, Ill. Mr. Carl has joined the Metallurgical Department of Allison-Bedford Foundry, Bedford, Ind.

Donald Williams has been appointed director of sales for the Dow Chemical Co., Midland, Mich., succeeding **Leland I. Doan,** newly-elected president of Dow. Mr. Williams was formerly general sales manager. **Donald K. Ballman,** assistant general sales manager, succeeds Mr. Williams as general sales manager, and **Dr. L. S. Roehm,** head of the Technical Service and

Development Division, will hold the position of assistant general sales manager in addition to his present duties.

Karl S. Howard, vice-president of the General Steel Castings Corp., Eddystone, Pa., was recently awarded the degree of Professional Engineer by his alma mater, Washington University, St. Louis.

L. D. Harkrider, president of the General Malleable Corp., Waukesha, was reelected president of the Wisconsin Manufacturers' Association.

D. L. Coleman has been named to head the new Eastern Texas Division of Ampco Metal, Inc., Milwaukee, and will make his headquarters in Houston.

G. R. Ritter is the newly-appointed superintendent of the United States Rubber Co.'s new aluminum foundry at Mishawaka, Ind. Mr. Ritter was co-developer of a process for producing aluminum molds for automobile floor mats and foam rubber, which will be used at the new plant.

OBITUARIES

S. Gee Lowe, president and chairman of the Board of Directors of Westlectric Castings, Inc., Los Angeles, Calif., died June 20.

Russell Glover Hay, 59, vice-president of the Ayers Mineral Co., Zanesville, Ohio, died June 27 at a hospital in Ocala, Fla., where he was under treatment for a heart ailment. Long prominent in the mineral and sand industry, Mr. Hay was for two years president of the National Industrial Sand Association, and was prominent in the affairs of the A.F.S. Sand Division for many years. A graduate of Ohio State University, Mr. Hay served overseas in World War I, and following a few years spent as a sales representative for the Goodrich Rubber Co. in South Africa, joined Ayers Mineral Co. in 1922. Mr. Hay was a salesman with the company until 1942, when he succeeded to the presidency upon the death of its founder, E. M. Ayers. In 1947, because of ill health, Mr. Hay became vice-president of the company, serving in an advisory capacity.

Edward R. Young, district manager for the Climax Molybdenum Co. of New York, died June 9.

Raymond T. Reese, retired general auditor of the American Smelting & Refining Co. and treasurer of the Copper Recovery Corp., died June 13. He was 75.

Joseph L. Dostal, 65, president and treasurer of the Dostal Per-Mold Foundry Co., Pontiac, Mich., died July 1. Mr. Dostal, who served for 15 years as vice-president and general manager of the Foundry Division of the Eaton Mfg. Co., Vassar, Mich., pioneered the development of permanent mold castings. He left Eaton in 1945 to form his own company.

John R. Forbes, president of the John R. Forbes Foundry & Iron Works, Jersey City, N. J., died June 22 at the age of 75.

CHAPTER ACTIVITIES

(Continued from Page 74)

evening at the Dodge Hotel, followed by a technical session in the hotel's Garden House.

George K. Dreher, executive director of the Foundry Educational Foundation, spoke on the *"Why What and How of Graduate Engineers."* Following a resume of the history of engineering education, Mr. Dreher emphasized the importance of educating engineers to the value of castings in industry. Foundry education, he said, will not only attract better men into the industry but will develop new customers by making engineers in related industries "castings conscious." College training, Mr. Dreher added, has become a necessary preliminary to entering the field of foundry management.

The following officers and directors of the Chapter were elected for 1949-50:

Chairman, A. A. Hochrein, Federated Metals Division, American Smelting & Refining Co., Baltimore; *vice-chairman,* Clausen A. Robeck, Gibson & Kirk Co., Baltimore; *Technical Secretary,* William H. Baer, U. S. Naval Research Laboratory, Washington, D. C. *Directors:* Thomas B. Belfield, Cochrane Foundry Co., York, Pa., and C. Douglas Galloway, Chambersburg Engineering Co., Chambersburg, Pa.

Chicago

Paul Skirha, Jr.
Crane Co.
Chapter Reporter

OFFICERS AND DIRECTORS of the Chapter met in June to discuss programs and business matters for the 1949-50 season. Presiding at the session was Chairman W. D. McMillan, International Harvester Co., Chicago, who announced the election of Martin Dietl, Crane Co., Chicago, and Lave G. Gustafson, Continental Machine Co., Hammond, Ind., as Chapter directors.

The office of treasurer, vacated through the resignation of Bruce L. Simpson, National Engineering Co., Chicago, was merged with that of Chapter Secretary George J. Biddle, Illinois Clay Products Co.

Program Chairman Alfred W. Gregg, Whiting Corp., Harvey, Ill., presented a tentative outline of

Mrs. Earl Tibbits, wife of foreman Earl Tibbits of the Los Angeles Steel Casting Co., and winner of a door prize at Southern California Chapter's Ladies' Night, May 21, receives prize from Committee Chairman L. M. Nash and Mrs. Nash.

1949-50 meeting programs. Included are four general meetings—in October, December, February and April—and round table meetings in November, January, March and May.

Tennessee Chapter
Carl A. Fischer, Jr.
Fischer Supply Company
Chapter Reporter

On June 17, the Tennessee Chapter held a dinner at the Chattanooga Golf and Country Club to celebrate the close of a 15-week Foundry Practice Course, and presented certificates to the graduates.

The course, started to increase the knowledge and skill of the members in general foundry practice, was sponsored by the University of Tennessee, Extension Division, and the A.F.S. Tennessee Chapter. George Hesse, U. S. Pipe and Foundry Co., was co-ordinator, and presided at the dinner meeting.

The speaker of the evening was P. A. Arnold, U. S. Pipe and Foundry Co., Chapter vice chairman. His subject was *"The Foundry Practice Course* as Seen From Management and A.F.S. Viewpoint."

F. C. Lowry, director of the University of Tennessee's Extension Division, spoke on the facilities available from the University for helping the people of Tennessee through extension courses.

W. L. Austin, U. S. Pipe &

Foundry Co., John Lasiter, Combustion Engineering Corp. and Samuel Leventhal of The Wheland Co. were the committee in charge of arrangements for the dinner.

Guests present were: Wiley Thomas, Jr., co-ordinator of College Engineering; James H. Williamson, and Roy Sullinger, coordinators of the Extension Division, all of the University of Tennessee; H. F. Bohr, Secretary-Treasurer of the Tennessee Chapter; Howard Barker, U. S. Pipe & Foundry Co.; and Samuel Johnson, The Wheland Co.

Short talks were given by Gordon Street, The Wheland Co.; Keith Harris, Ross Meehan Foundries, Inc., O. E. Walker, Columbian Iron Works; Harry Griscom, The Wheland Co.; and Samuel C. Northington, Combustion Engineering Co.

Certificates were presented to the following:

From U. S. Pipe and Foundry Co.—George Hesse, Wallace Erb, W. H. Lawrence, Knox Riley, C. A. Riggs, Jr., W. L. Austin, B. E. Howard.

From The Wheland Co.—Karl Landgrebe, Samuel Leventhal, Thomas Alford, Henry Lukrafka, Thomas Deakins.

From The Crane Co.—Harry Nelson, Carl Barker, J. D. Cliett, Jr.

From Combustion Engineering Corp.—Charles Chisholm, Robert Young, John Lasiter, John Kosik, Arden Imm, John Gryder.

From Columbian Iron Works—Don Andrews, C. E. Jones.

From Ross Meehan Foundry Co.—William Greiser, Clayton Genung.

Northwestern Pennsylvania

James J. Farina
American Sterilizer Co.
Chapter Reporter

THE LAST MEETING of the season, held June 27 at the Moose Club, Erie, was Election Night. The following officers were elected:

Chairman, Joseph Shuffstall, National Erie Corp.; *vice-chairman*, Frank P. Volgstadt, Griswold Mfg. Co.; *treasurer*, Fred J. Carlson, Weil-McLain Co.; *secretary*, Earl Strick, Erie Malleable Iron Co.

Directors (to serve three-year terms): Charles Gettschalk, Cascade Foundry Co.; William Piper, Erie Bronze Co.; C. C. Hahn, National Transit Co.; and Roy Loder, Erie Malleable Iron Co. (to fill unexpired term of Fred Carlson).

FIRM FACTS

(Continued from Page 80)

Machine Division, the **Union Steel Castings Division,** and the **Pittsburgh Rolls Division,** all of Pittsburgh—will be modernized at a cost of $1,500,000. Production will continue despite alterations. The program includes purchase of additional property and equipment.

Woodland Foundry, Inc., Woodland, Wis., has been incorporated by Olaf Bie, John Smith and Bernice Schroeder to produce brass and iron castings.

Williams Bros., Inc., Elkhart, Ind., recently built a new addition and installed modern equipment in its brass and aluminum foundry.

The new address of **Edwin K. Smith,** consulting engineer to the foundry industry, is 1429 Santa Fe Ave., Los Angeles 21. Mr. Smith was formerly located in Beverly Hills, Calif.

Tracing its history back to the days of Charles II, England's Garton & King, Ltd., foundry at Exeter claims the youngest (average age, 32) foundry staff in the British Isles. Although a golden hammer hanging above the door reminds visitors that the firm was an established ironmongery in the early 1700's, Garton & King, Ltd., today places emphasis upon youth rather than tradition.

Back in 1932, Garton & King employed six men and produced about two tons of castings per week. The management, deciding it was high time that production levels were increased and foundry facilities expanded, foresaw that its primary requisite for expansion was a supply of skilled molders. There were none available and no young men being trained in the trade at the time, so the company started its own school, using its plant as a classroom and its skilled molders as teachers. Of the 80 young men trained by Garton & King, almot all have remained in the foundry industry, and the majority of the 64 workers presently employed by the firm are "graduates" of the school.

The result of this foresight was apparent almost immediately in increased production. Today, an average of 23 to 25 tons of castings are produced weekly, and overall production is up 40 per cent.

Managing Director H. E. Holladay and Works Manager A. Jackson, themselves young men, have been largely responsible for the rejuvenation of Garton & King. They encourage cooperation between worker and management and have evolved a time-sharing bonus plan which encourages a high standard of productivity and employee morale.

Garton & King, which specializes in molding gear wheels of all types, is proud of its past achievements, such as the pioneering of sectional radiators and cottage stoves, but is equally proud of its progressive attitude. The secret of its success, according to Mr. Holladay, is "A right combination of discipline, good management and good relationship between workpeople and management."

NEW PRODUCTS

(Continued from Page 77)

steel, brass, solder, aluminum and magnesium. It is also suitable for finishing and sanding wood products.

Battery Charge Control

AG19—General Electric Co.'s new sequence charge control is a device which can be attached to G-E rectifier type truck battery chargers and is claimed to double their working capacity. The device makes it possible to charge two fully-discharged batteries in 13 hours from a single rectifier and utilizes the G-E automatic two-rate method of charging. A high starting rate is applied first to one battery to bring it up to 80 to 90 per cent of full charge, then to the second battery. Both batteries are then automatically given the finishing charge at the same time. Sequence charge control requires only two hours to install.

Portable Transformer

AG20—Designed to safeguard industrial workers in damp or wet locations from the possibility of fatal electric shock while working with conventional 110-volt extension lamps is Etraco Mfg. Co., Inc.'s portable safety transformer. The new device, Saf-T-Lite, is a portable step-down transformer which reduces a 110-volt circuit to a harmless 6 volts. Waterproof, the transformer can be connected to any electrical outlet and can be hung from wall fixture or left on either floor or table. Available as transformer with leads, or as complete trouble lamp with 5 ft of heavy extension cord.

Welding Goggle

AG21—Greater strength and less weight are features of Willson Products, Inc.'s welding goggle with cups of nylon plastic. Nylon in plastic form has great compressive strength and impact resistance, thus offering extra safety when eye protection is required, and will last a lifetime even under extreme service conditions. Other features of the goggle are (1) rolled edges to reduce pressure around eye socket (2) adjustable leather bridge and headband (3) triangular lenses for wide vision, and (4) screened indirect ventilating ports which admit sufficient air to prevent fogging, but keep out dust and particles. Goggle is also available with direct ventilating ports and clear, impact-resisting lenses for chipping work.

Vertical Sander

AG22—Weighing only 8 lb, 7 oz, and having an overall height of 7 in., a vertical sander announced by Buckeye Tools Corp. is particularly suited to precision work because of its unusual ease of handling. The tool is also designed as a grinder with cup-type, counter-bored center wheels and cup wire brushes. It is available in free speeds of 4500, 5500, 6000, 7200 and 8500 rpm, and is equipped with a governor which assures constant speed under load.

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NEW PRODUCTS

(Continued from Page 91)

Valve Refacer

AG23—A streamlined basic model of the Thor refacer line, designed for precision wet grinding has been developed by the Independent Pneumatic Tool Co., Aurora, Ill. Equipped with a double-grip collet and speed chuck for fast precision valve refacing at all standard angles, the Thor "99" is of extra heavy construction, with automatic bearing compensation at all critical points of wear. Sliding heads feature smooth-riding, three-point suspension on hardened and ground slide rods. New speed chuck permits even large butt-end valves to be admitted and released with only one turn of the 2½ in. hand wheel.

Hand Miller Attachments

AG24—Several new attachments are available for use with the Rouse Hand Miller in handling light cuts in brass and aluminum, etc. The No. 7 Vise is fitted with a slotted removable jaw for holding odd-shaped pieces and can be converted into an economical jig for use on other equipment. The new No. 9 cast iron safety cutter guard can be adjusted to the left or right by the hand miller operator to insure adequate hand protection on any type of job. The guard may be drilled for a coolant fitting to convey the coolant directly to the cutting tool.

Oven Temperature Tester

AG25—A portable oven-temperature tester for checking the performance and efficiency of heating appliances is announced by the General Electric Co. Type DO-50 Tester is a sensitive d-c millivoltmeter calibrated for use with iron copnic thermocouples having a resistance of 2.0 ohms, and was developed to aid plant maintenance engineers, and laboratory technicians to obtain quick accurate readings on oven efficiency. Tester consists of a 3½-in. panel instrument mounted in leatherette covered case with assembly and leads storage compartment. With scale range from 0 to 650F, instrument has an accuracy of plus or minus 5 per cent of full-scale value.

Dry Chemical Extinguisher

AG26—A dry chemical type fire extinguisher, announced by the American La France Foamite Corp., has, according to the manufacturer's claims, such advantages as longer range and duration of discharge, more complete discharge of dry chemical contents, gas-tight all-internal expelling gas connections, built-in safety disc and lightness of weight. The dry chemical is non-toxic, non-corrosive, non-conductor of electricity, and will not freeze. Extinguisher is recommended for flammable liquid and electrical fires and for all industrial types of fires. The extinguishing effectiveness of this hand portable Unit No. 30 is described by the manufacturer as "phenomenal".

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plained are principles of powder compaction, powder behavior, methods of fabrication, equipment, die and punch materials and design, operation of presses, hot pressing, and sintering. Three final chapters are devoted to plastic deformation, cold and hot working deformation, re-sintering, hardening, softening and finishing treatments. Volumes II and III of the series are now in preparation. Volume II will cover applied and physical powder metallurgy and Volume III will be a complete bibliography of world literature and patents on powder metallurgy.

Die Casting Design

Practical Considerations in Die Casting Design. 246 pp. illustrated with photographs. Published by New Jersey Zinc Co., 160 Front St., New York 7. $3.00. (1948).

Like its predecessor, *Die Casting for Engineers*, published in 1942 and in 1946, this volume is devoted primarily to a discussion of specific designs and applications of die castings to industry, and to the practical considerations involved in their design. Included are chapters on design, section thickness; ribs, fins and bosses; cores, undercuts, fillets and edges; wheels, gears and cams; die cast threads and their uses, fastening expedients, inserts, flash removal, piercing and forming, polishing and appearance factors. Concluding the book is an extensive bibliography.

Laminates

Engineering Laminates, edited by Albert G. H. Dietz, Sc.D., with a staff of 24 contributing experts. 797 pp. illustrated with photographs, charts and diagrams. Published by John Wiley & Sons, Inc., New York. $10.00. (1949).

This volume explains the mechanics of laminate materials from basic properties through physical and chemical properties, to industrial uses. Included are sections on adhesives, glue-laminated wood, thermostat metals, aluminum-clad products, hot-dipped aluminum coated steel, copper and copper alloy clads; nickel-clad, monel-clad, inconel-clad and stainless-clad steel; cast laminated metallic materials; hardness and wear resistance; sprayed metal, as well as several sections on lamination of woods, rubber, glass and other materials.

Conference Planning

Making Conference Programs Work, by M. F. Stigers. 256 pp. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. $3.50. (1949).

Written by an associate professor of trade and industrial education at Purdue University, this volume explains the basic techniques in organizing and conducting various types of conferences. Ways of making physical arrangements, handling of cross-table discussions and the use of visual aids, plus instructions for meeting virtually any emergencies that may arise in conference planning, are explained. Chap-

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ters cover information sheets and training of conference leaders, how to use a conference program, and authenic reports of actual conferences.

Welding Terms and Processes

Standard Welding Terms and Their Definitions. 50 pp. $1.00. (1949). *Standard Master Chart of Welding Processes and Process Charts.* $0.35. (1949) Published by American Welding Society, 33 West 39th St., New York 18.

Standard Welding Terms and Their Definitions, containing 57 illustrations, is the result of four years' research and defines some 500 welding terms.

Master Chart of Welding Processes and Process Charts lists the 37 welding processes in commercial use today, and compares their fundamental characteristics.

Starting A Small Business

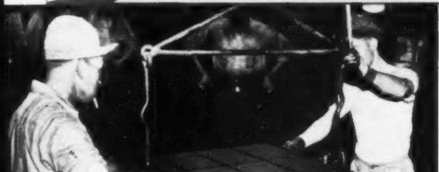
Information Sources for Small Businesses, by James C. Yocum and Emma Ferrin. Second edition, $0.50. (1948). 94 pp. indexed. Published by the Bureau of Research of Ohio State University.

Volume contains a selected list of sources of information on beginning and operating a small business. Section I of the booklet gives selected references, annotated by business function, such as ways to begin a business, personnel requirements, securing capital or credit, analyzing the market, etc. Section II classifies reference works by type of business. Of several reference works dealing with the establishment of a small foundry, the A.F.S. publications CLASSIFICATION OF FOUNDRY COST FACTORS and FOUNDRY COST METHODS are among those listed.

Magnetic Particle Inspection

Principles of Magnaflux, by F. B. Doane and C. E. Betz. Third edition, 388 pp. 178 illustrations. Published by Photopress, Inc., Chicago. $5. (1949).

Extensive new methods, new materials and new approaches to non-destructive testing with magnaflux have been added to the editorial content of this revised edition. Written to furnish supervisory personnel, inspectors and operators with a single source of information for inspecting with magnaflux, this edition covers basic electrical and magnetic principles, methods, materials and the newest and most effective high-production equipment. This volume will serve as a working handbook for those who are using this testing process; as a planning guide for those laying out or reorganizing their inspection programs; and as a reference tool for management. Chapter subjects include: magnetism, fundamental concepts, magnetizing methods, field distribution, magnetizing current characteristics, the inspection medium, detectible defects, indications of surface and subsurface defects, inspections of welds and large castings and forgings, non-relevant indications, demagnetizing, interpretations of indications, and evaluations.



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